FATHER ENGAGEMENT, RESIDENCY STATUS AND CHILD WELL BEING AMONG BLACKS AND HISPANICS IN THE UNITED STATES

by
Desmond D. Flagg

A dissertation submitted to the Johns Hopkins University Bloomberg School of Public Health in conformity with the requirements for the degree of Doctor of Philosophy

Baltimore, Maryland

June 2015

ABSTRACT

This thesis compares patterns of engagement between resident and nonresident fathers, and examines how nonresident father engagement affects the academic achievement and obesity risk of their children. Understanding the patterns of engagement by fathers' residency status is important given prior research suggesting that nonresident fathers, who are more likely to be Black and Hispanic, may be less engaged than resident fathers. Father's residency status may have significant implications for health outcomes in their children. Prior research suggests that children who live in households without their father have lower academic achievement, and that involvement from nonresident fathers may increase child obesity risk. However, there is an absence of research concerning how differences in the type of engagement activity influence child academic achievement and obesity. Improved knowledge about the association between nonresident fathers and the academic achievement and obesity risk of their children is important given that obese children are more likely to become obese adults, and therefore experience increased risk of diabetes, hypertension and myocardial infarction; while poor academic achievement in early adolescence increases the risk of high school dropout, which in turn is increases the risk of a number of adverse health conditions including depression, substance abuse, sexually transmitted disease, unplanned pregnancy, amongst others. This thesis is guided by the social-ecological model which posits that individual behaviors and outcomes are influenced by a variety of interrelated societal, community, interpersonal and individual factors. The data for this thesis come from the Fragile Families and Child Wellbeing Study (1998 - 2007), a cohort of mostly low-income unmarried parents and their children living in urban areas in the United States.

This thesis has three aims. The first aim is to describe the patterns of father engagement among Black and Hispanic resident and nonresident fathers. The second and third aims of this thesis focus on Black and Hispanic nonresident fathers, and examine whether their engagement is associated with a) their children's academic achievement and b) their children's risk of obesity. The results of this three-aim thesis are described hereafter. The results from Aim 1 indicate that nonresident fathers were significantly less likely to engage in activities with their children from infancy through early adolescence compared to resident fathers (56% to 98%, $p<0.05$), while engagement among all fathers (both resident and nonresident) decreased over time (92% at age 1 to 42% at age 9). The results for Aim 1 did not indicate a statistically significant difference in father engagement by race or ethnicity. The results from Aim 2 demonstrate that, overall, nonresident father engagement did not have statistically significant effect on reading achievement or math achievement in early adolescence. However, nonresident father engagement in the activity of reading books with their child was associated with a higher reading achievement scores (93.2 to 86.5, $p<0.05$). The results from Aim 3 indicate that, in general, nonresident father engagement did not yield a statistically significant impact on obesity risk among early adolescents. However, nonresident father engagement in the specific activities of watching television and playing video games were associated with a higher risk of obesity (38% to 22%; 37% to 24% $p<0.05$). These results suggest that effect of nonresident father engagement on adolescent health and wellbeing may depend on both the nature of the engagement activity and the health outcome.

The implications of these findings are two-fold. First, these findings call for further research. Specifically, further research is needed to assess patterns of nonresident father engagement at later child ages (e.g., calling child on the phone at age ten, emailing child at age

thirteen, attending child's basketball game at age 16, etc.) as the available data stops at the age of nine-years-old, as well as the impact of this engagement on child health outcomes. It will also be important to more carefully examine the impact of 'positive' (e.g., reading books) versus 'negative' (e.g., watching TV) on children's health and how this impact varies over childhood. Second, these findings have implications concerning federal policies such as Responsible Fatherhood programs which promote nonresident father engagement by mentoring fathers and teaching them parenting skills, and Healthy Marriage Programs which seek to reduce father absenteeism by providing relationship and premarital counseling services to unmarried couples with children.

Committee Chair: Dr. Robert Blum

Academic Advisor: Dr. Sara Bleich

Additional Committee Members: Dr. Keshia Pollack and Dr. David Altschuler

Table of Contents

ACKNOWLEDGMENTS

It is impossible to enumerate the number of people, nor the magnitude of their offerings and sacrifices, which made the manuscript that follows possible. What follows is my attempt at the impossible.

First, I'd like to thank the admissions committee at the Johns Hopkins Bloomberg School of Public Health for admitting me amongst a pool of some of the top minds in public health. I consider my admittance here an honor and a blessing, one which I do not take for granted. Similarly, I'd like thank Eddie and C. Sylvia Brown for their gift of the Brown Scholarship in Community Health. I wear the title of "Brown Scholar" with a great deal of pride. We are a special and grateful group, none of whom would be here without the generosity of the Browns. In that same vein, I'd like to thank Dean Klag, and Dr. Blum, the "father" of the Brown Scholar program. We are indeed "his children", as he indicates at our annual luncheons and dinners, and I thank him personally for the fatherly advice which he has provided to me throughout my enrollment here.

I'd like to thank my Thesis Committee for reading through my dissertation, and providing cover-to-cover feedback. Each of which are deserving to be mentioned by name, Dr. Robert Blum, Dr. Sara Bleich, Dr. Keshia Pollack and Dr. David Altschuler. This work would not be possible without their tireless efforts. I'd like to thank Dr. Altschuler in particular for his subject-area expertise and critical insight concerning the policy implications of my work.

I'd like to thank Dr. Keshia Pollack for her personal and professional support over the past six years. She is perhaps best known for her relentless work ethic and intelligence, but I've had the honor of knowing her as a dear friend and mentor, and my time here at Hopkins would not have ended in a successful fashion without her shoulder to lean upon, and a kick in the rear

when I needed it. She has been present from my first day here to my last, and has watched and listened my struggles and successes. She knows me perhaps better than anyone at Hopkins, and the fact that I can still call her a friend and mentor throughout all of it helps me to realize that it was all worth it.

Although her name will not appear on my degree, Dr. Sara Bleich deserves to have another set of acronyms after her name. It is no understatement to indicate that I have completed this dissertation because of her personal sacrifice of extending patience and understanding beyond that of what is required by an academic advisor. In short, I have completed this dissertation because Dr. Sara Bleich demonstrated patience and compassion when others would not, while advocating for my retention in the program. I will be forever thankful for her turning her office into a therapeutic counseling room in an effort to provide me with the support and motivation that I needed.

To Emma and Dasher, I love you very much. My love for you both is present on each page that follows. There exist no words which can express how much you mean to me, so I had to write a dissertation about it. Dad did this for you. Dad loves you.

To my brother Demond and my mother Charlene, we did it. No one knows how important this work is more than us. We lived it. We made it. We did it.

Last, to my Dad, James Banks. Our bond is unbreakable. I appreciate the value of father engagement because of you, and I submit this dissertation in honor of you. I am proud to have you as my Father. Every day, I desire to be as strong and as wise as you. I love you very much. I hope that this work makes you proud. Your wisdom, insight and fathering is what enabled me to finish this when I was at a crossroads in my life. Fathering never ends, and you were the father that I needed all of my life when it mattered the most. When I felt that no one in this

world understood me or valued me, you were there to put your arm around me and to guide me, just as a father should be.

LIST OF TABLES AND FIGURES

Page

Tables

Figures

I. CHAPTER ONE: INTRODUCTION

I.a. Study Aims

This thesis has three specific aims. The first aim is to describe the patterns of father engagement with their children among Black and Hispanic resident and nonresident fathers. For this thesis, nonresident fathers are defined as those who live with and away from their children respectively.[1] Understanding patterns of father engagement by residency status is an important area of focus given prior research which suggests that nonresident fathers may be less engaged than resident fathers,[15-18] and earlier studies indicating that father engagement is protective against poor health outcomes in children.[25-32] Understanding patterns of father engagement by race is a particularly important area of inquiry given that 51 percent of Black children and 28 percent of Hispanic children live in households and without their biological father, compared to 18 percent of White children.[6]

The second aim of this thesis focuses on Black and Hispanic *nonresident* fathers and examines whether father engagement is associated with their children's academic achievement. Understanding this relationship is a critical public health question as academic achievement in early adolescence is predictive of high school completion−a key socioeconomic determinant of health.[2,3] The existing literature suggests that academic achievement is higher among children whose nonresident fathers are engaged with them compared to those whose nonresident fathers are not engaged; however, there is limited research on Black and Hispanic populations.[4] The little research that does exist indicates that the effect of nonresident father engagement on child academic achievement among Blacks and Hispanics is dependent on a number of social and economic factors, including father education, father income, and a father's relationship with his child's mother. Specifically, Black and Hispanic fathers who have higher levels of education,

higher incomes, and who have better relationships with their children's mother have a more positive effect on their children's academic achievement (i.e., their children have higher test scores and are more likely to graduate high school) compared to fathers with lower education, lower income, and poorer relationships with their children's mother.[19,20] The main hypothesis of this aim is that among nonresident fathers, those who are engaged with their children (compared to those who are not engaged) will have children with higher academic achievement, regardless of race. Nonresident father engagement is associated with higher child academic compared to nonresident father absenteeism, regardless of race. This hypothesis is based on the existing literature which indicates that nonresident father involvement is associated with higher academic achievement in children.[4,31-33]

The third aim of this thesis also focuses on *nonresident* fathers and examines whether father engagement is associated with their children's obesity risk. This is an important area of research given that obese children are more likely to become obese adults,[5] and because Black and Hispanic children are at higher risk for obesity compared to White children.[6] The small body of literature examining the relationship between father's residency status and obesity risk suggests that father's engagement may be positively associated with obesity risk in children.[36] The main hypothesis of this third aim is that nonresident father engagement is associated a reduced child obesity risk compared to nonresident father absenteeism. This hypothesis is based on prior evidence which indicates that father engagement 1) improves child consumption of breakfast and vegetables, and 2) reduces the risk of child food insecurity, both of which have been found to promote a healthy weight in children.[27,28]

This thesis makes a unique contribution to the public health literature by applying a public health lens to a topic typically explored by social scientists, while using data that that has

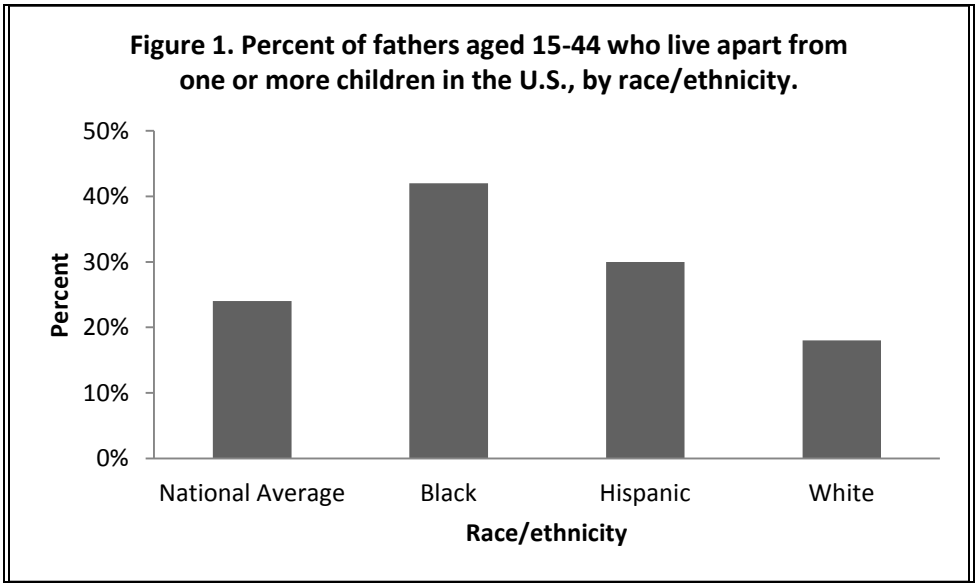
been largely unexplored by public health researchers. For example, data from this thesis are from the Fragile Families and Child Wellbeing Study (Fragile Families), a national longitudinal study of nearly 4,000 groups of mothers, fathers and their children. Although the Fragile Families study has been used to publish nearly five hundred peer-reviewed journal articles, fewer than fifteen of these publications appear within the American Journal of Public Health – one of the premier public health journals.[7] Most of the publications documenting findings from the Fragile Families study explore social phenomena such as incarceration patterns, domestic abuse and relationship patterns (e.g., marriage, cohabitation and divorce), and are published within leading social science journals (e.g., Journal of Family Issues, Journal of Marriage and Family, Social Sciences Quarterly, etc.).[7] This thesis adds to the existing literature by examining the public health implications of specific types of father engagement, with the goal of identifying how public policy can promote beneficial forms of nonresident father engagement.

What this thesis does not do is compare any relative benefit of father engagement by residency status (i.e., a comparison between the benefit of resident father engagement versus the benefit of nonresident father engagement), nor does this thesis make comparisons among resident fathers by marital status (i.e., the effects of father engagement between resident fathers who are married to their child's mother versus those who are not married to their child's mother). This thesis also does not explore the impact of other forms of father engagement, such as in-kind support (e.g., provision of clothes, food, diapers, etc.) or monetary support (e.g., child support payments, paying bills, etc.). Although these may be important areas for future research, they are not within the research focus of this thesis.

The pages which follow summarize the current literature on fathers, father engagement, and the effect of that engagement on the health and wellbeing of their children.

I.b. Nonresident Fathers in the U.S.

Figure 1 illustrates the prevalence of nonresident fatherhood in the U.S.. The national average of nonresident fathers is 24 percent,[11] and Black fathers (42 %) and Hispanic (30 %) fathers are more likely to not live with their children than White fathers (18 %).[11]



SOURCE: CDC/NCHS, National Survey of Family Growth, 2006–2010.

Table 1 describes the demographic characteristics of resident and nonresident fathers. Roughly half of resident (43 %) and nonresident (47 %) fathers are less than thirty-five years of age.[1] Three-fourths (75 %) of resident fathers are married compared to just over one-third (38 %) of nonresident fathers.[1] Half (50 %) of resident fathers have a college-level education or higher compared to a third (30 %) of nonresident fathers.[1]

Table 1. Descriptive characteristics of fathers age 15-44 in the U.S., by father residency.			
	National Average (%)	**Resident (%)**	**Nonresident (%)**
Age			
Less than 35 years	44	43	47
Marital Status			
Married	66	75	38
Education			
Some college or more	45	50	30

SOURCE: CDC/NCHS, National Survey of Family Growth, 2006–2010.

*Source did not indicate whether a statistically significant difference between categories exists.

Trends in nonresident fatherhood are best understood by evaluating trends in the number of children living in single parent households.[8] This is because national survey data has only recently began to collect valid and reliable information concerning the prevalence of nonresident fatherhood.[9] For example, the National Survey for Family Growth−the primary source for family population data from the National Center for Health Statistics−has been collecting data on U.S. families since 1973, but only began collecting data on nonresident fathers in 2002.[8] The lack of accurate information about trends in nonresident fatherhood was expressed in detail by Stykes et al. in a 2012 study. Here, the authors explain that:

> The quality of data collected on nonresident fathers in the 1980s and 1990s was extensively scrutinized by a number of prominent scholars who concluded that household surveys underestimated the presence of nonresident fathers...research on fatherhood in the 1990s noted that household surveys produced low estimates of nonresident fatherhood because nonresident fathers were more likely to be institutionalized and often simply were not included in household surveys. Others also suggested men were less likely to report having nonresident children than women who readily reported having a child whose father lives elsewhere.[7(p 3)]

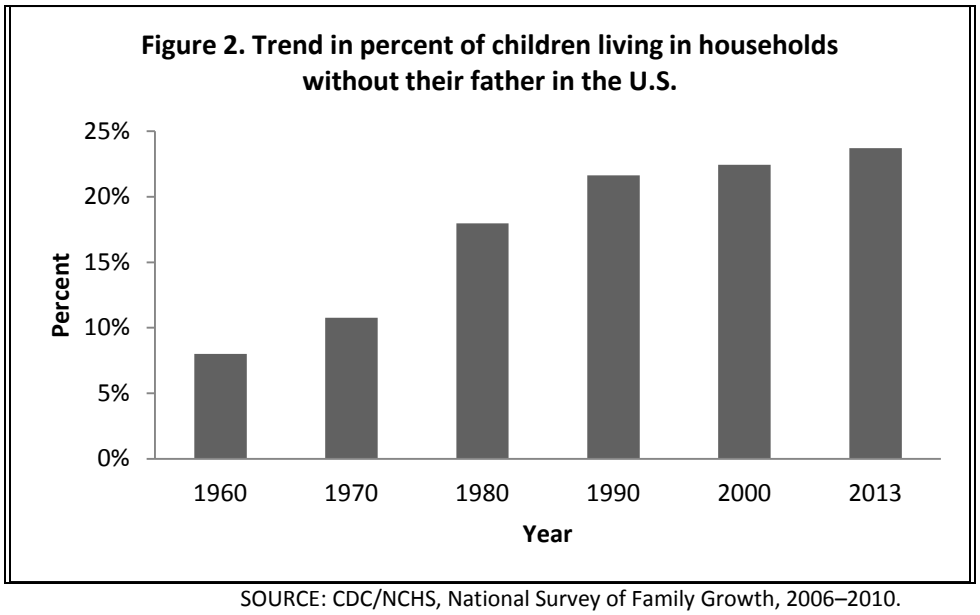
The authors summarize their findings by indicating that:

> The Current Population Survey, Survey of Income and Program Participation, and National Survey of Family Grow all underestimated nonresident fatherhood by excluding institutionalized men....[W]e are unaware of a recent nationally representative, cross-sectional survey allowing researchers to present estimates of nonresident fathers for the entire U.S. population. This is problematic as multiple scholars have demonstrated specific subgroups of men (who are also more likely to be nonresident fathers) more often experience incarceration.[7(p17)]

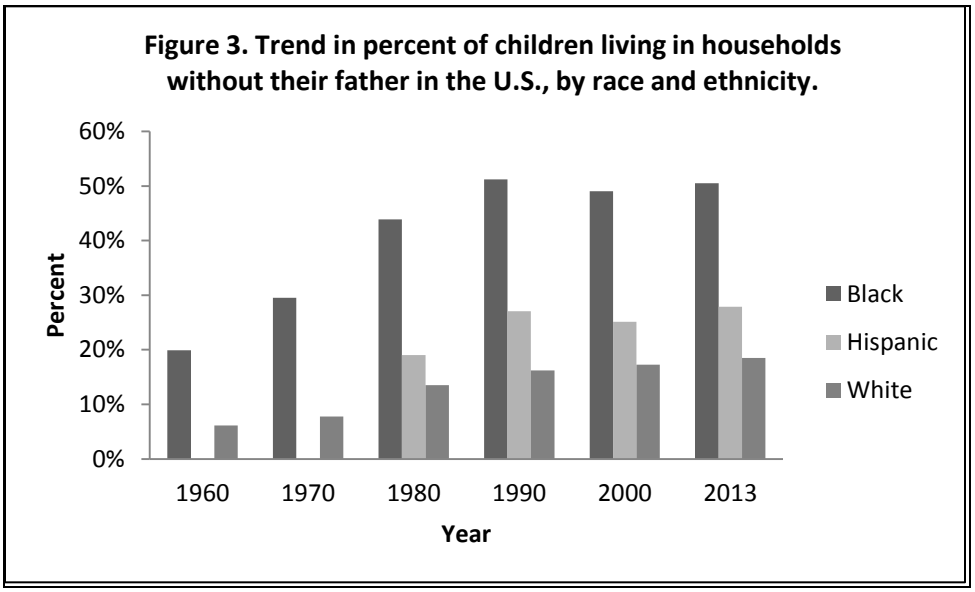
Due to the absence of reliable data concerning trends in the prevalence of nonresident fatherhood, trends in the number of children who live in households without their father are described below.[7]

I.b.i. Children Living In Households without Their Father

As indicated by Figure 2, the national prevalence of children who live in households without their father has tripled from 8 percent in 1960 to 24 percent in 2013.[10] Figure 3 illustrates this trend by race and ethnicity, and indicates that that prevalence of Black children who live in households without their father has more than doubled from 20 percent in 1960 to 51 percent in 2013; that the prevalence among Hispanic children who live in households without their father has increased from 19 percent in 1980 to 28 percent in 201; and that the prevalence of White children who live in households without their father has increased from 6 percent in 1960 to 18 percent in 2013.[14]



SOURCE: CDC/NCHS, National Survey of Family Growth, 2006–2010.

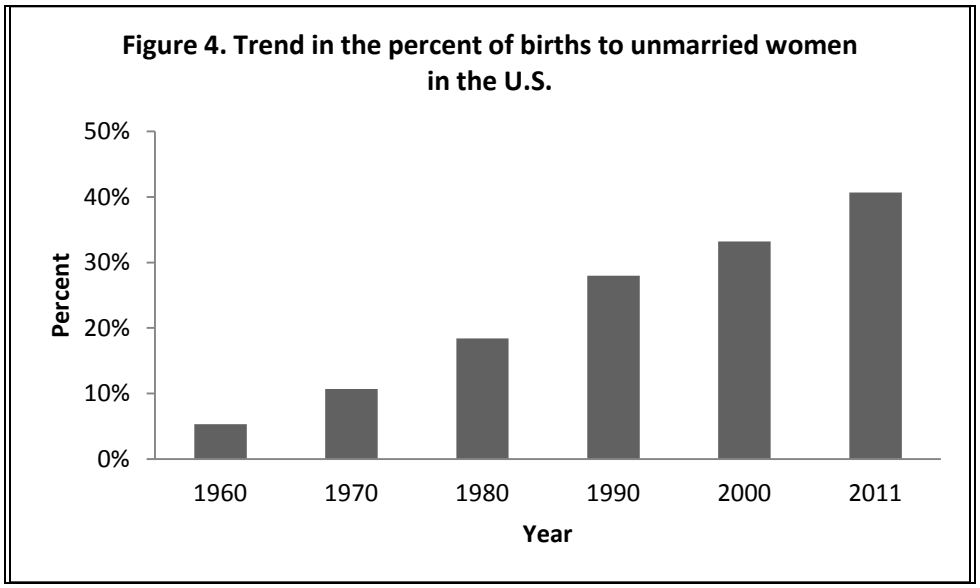


SOURCE: U.S. Census, Living Arrangements of Children, 1960-2013.

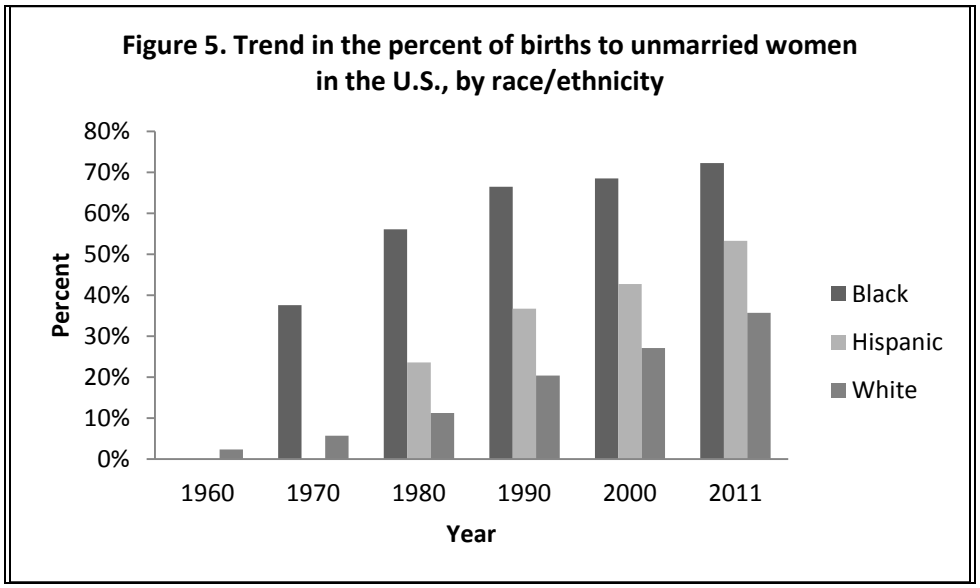
I.b.ii. Children born unto Unmarried Parents

Research indicates that children born to unmarried parents are at increased risk of living in households without their fathers.[11] Therefore, data on children born to unmarried parents is commonly used as an indicator of the number of children at risk of living in a household without their father.[10]

As demonstrated by Figure 4, the prevalence of children born unto unmarried parents has experienced nearly an eight-fold increase since 1960.[10] In 1960, 5 percent of children were born unto unmarried parents and by 2011, that number had increased to 41 percent. Unmarried childbearing has been consistently higher among Blacks compared to other races and ethnicities.[10] For instance, as Figure 5 illustrates, in 1960, 38 percent of Black children were born unto unmarried parents,[10] and by 2011, that figure had increased to 72 percent.[10] These statistics are considerably higher as compared to Hispanic or Whites.



SOURCE: National Center for Health Statistics.



SOURCE: National Center for Health Statistics.

I.c. Father Engagement among Nonresident Fathers

Research demonstrates that nonresident fathers are less engaged in their children's lives than resident fathers, but that levels of engagement differ by two important indicators: father education and father's relationship with child's mother[1, 19-22]

Father Education and Nonresident Father Engagement

Overall, the literature on nonresident father engagement indicates that nonresident fathers are less engaged than resident fathers, but that engagement among nonresident fathers is influenced by a number of individual and interpersonal factors.[13-16] In particular, nonresident fathers who have a positive relationship with their child's mother and those have a college-level education or above are more likely to engage in activities with their children.[19-22]

King et al. released one of the first studies on nonresident father engagement in 2004.[12] Using a sample of 5,377 middle school and high school students with nonresident fathers from the National Longitudinal Study of Adolescent Health, the authors found that father education and predicted patterns of father engagement.[17] Using measures such as "going to the movies" and "communicating about school", the authors found that fathers with a college education versus high school education were more likely to be engaged with their child.[17] The authors also found that although nonresident White fathers were more likely engaged with their child than nonresident Black and Hispanic fathers, these differences could be explained by differences in father education.[17]

Father education was also found to affect engagement in a 2009 investigation of 549 nonresident fathers from the Fragile Families and Child Wellbeing Study by Fagan et al. Here, the authors found that father engagement in activities such as singing songs, playing games and reading books with their 3-year-old children could be predicted by father's relative levels of "risk" and "resilience".[13] The authors define "risk" as psychological or social factors which hinder a consistent pattern of fathers' engagement with children.[16] Low education was one of the primary risk factors which reduced father engagement.[21] Conversely, the authors describe "resilience" as internal or interpersonal factors which increase the likelihood of father

engagement even when faced with barriers to paternal involvement.[21] Pursuing higher education and higher levels of employment were listed as some of the primary measures of resilience which improve father engagement.[21]

In 2013, Jo Jones and William Mosher from the National Center for Health Statistics studied 2,200 fathers with children less than five-years of age, and 3,166 fathers with children age five- to eighteen-years from the National Survey of Family Growth.[1] The authors found that engagement in activities such as "feeding" and "bathing" children less than five years of age was much more common among resident than nonresident fathers, and similarly found that engagement in activities like "helping with homework" or "talking about day" with children age five- to eighteen years was also more prevalent among resident fathers versus nonresident fathers.[1] The authors also found that nonresident college-educated fathers were more likely to be engaged with their children than nonresident fathers with a high school diploma or less.[1] The results of this study support the previously reported findings concerning higher engagement among resident versus nonresident fathers, as well as higher engagement among college-educated nonresident fathers versus nonresident fathers without a college education.[1]

Father's Relationship with Child's Mother and Nonresident Father Engagement

On the whole, the literature on father's relationship with their child's mother and nonresident father engagement indicates a positive association between relationship status and engagement.[18-22] In other words, nonresident fathers who have a positive relationship with their child's mother are more likely to engage with that child, while nonresident fathers who have a negative relationship with their child's mother are less likely to engage with their child in common.[18-22]

A 2004 publication by Cabrera et al. used data on 2,147 participants from the Early Head Start Research and Evaluation Project to assess father engagement among low-income fathers and their two-year-old children.[14] Using measures of engagement such as "physical play", "takes care of child", and "changes child's clothes", this study found that resident fathers were more engaged than nonresident fathers, but that engagement among nonresident fathers varied by father's relationship with child's mother.[18] Specifically, the study found a declining pattern of engagement by father's status as "boyfriend", to "friend" to having "no relationship" with child's mother.[18] The results of this study suggest that father engagement may be mediated by father's relationship with child's mother.[18]

In 2008, a subsequent study on father engagement among two year old Early Head Start participants by Cabrera et al. found that differences in parents' relationship quality also explained variation in nonresident father engagement across racial and ethnic groups.[15] In particular, nonresident White fathers were less involved with their children than Black and Hispanic fathers.[18] The authors found that this difference was explained by differences the status of mother-father relationships.[18] Specifically, White nonresident fathers were less likely than Black and Hispanic nonresident fathers to maintain romantic relationships with their child's mother.[20] In addition, mothers in the White father group were also more likely to re-partner, which further reduced engagement from White biological fathers.[18] The findings of this study indicate that differences in father engagement by race and ethnicity may be explained in differences in the relationship quality between father and mother.[18]

The aforementioned 2009 investigation of 549 nonresident fathers from the Fragile Families and Child Wellbeing Study by Fagan et al. also found that poor relationship quality with child's mother was a primary risk factor which reduced father engagement.[21] Similarly,

Tauch et al. studied 3,710 fathers and their children at ages 1, 3 and 5 from the Fragile Families Study in a 2010 publication.[16] In this study, the authors found that having subsequent relationships, and having children within those relationships, predicted declines in father engagement in activities such as helping with household chores and playing inside over time.[22] Moreover, the authors found that mothers' subsequent relationships and children from those relationships was twice as predictive as fathers' subsequent relationships and children.[22] In fact, the study found that mothers subsequent partnerships was as predictive of father engagement as fathers education.[22] The authors hypothesize that the subsequent relationships and children may deteriorate quality of the relationship between mother and father. The results of this study demonstrate the impact of parents' subsequent partnerships−and having children within the partnerships−on parental relationship quality and nonresident father engagement.[22]

In 2013, Jo Jones and William Mosher from the National Center for Health Statistics studied 2,200 fathers with children less than five-years of age, and 3,166 fathers with children age five- to eighteen-years from the National Survey of Family Growth.[1] The authors found that engagement in activities such as "feeding" and "bathing" children less than five-years of age was much more common among resident than nonresident fathers, and similarly found that engagement in activities like "helping with homework" or "talking about day" with children age five- to eighteen-years was also more prevalent among resident fathers versus nonresident fathers.[1] The authors also found that nonresident college-educated fathers were more likely to be engaged with their children than nonresident fathers with a high school diploma or less.[1] The results of this study support the previously reported findings concerning higher engagement among resident versus nonresident fathers, as well as higher engagement among college-educated nonresident fathers versus nonresident fathers without a college education.[1]

I.d. Nonresident Father Engagement and Child Health and Wellbeing

Over the past few decades, a considerable body of research has focused on the role of nonresident fathers in the health and development of their children.[23-25] Much of this research has centered upon how the absence of fathers creates an economic burden on mothers.[23-25] Researchers have consistently found that the financial contribution of nonresident fathers is associated with better health and behavioral outcomes in children.[17,18] More recently, this research has focused on the association between nonresident father engagement and the health and wellbeing of their children.[26-29] Several studies have indicated that father absence is associated with poor child health outcomes,[26-29] and a number of studies have demonstrated that nonresident father engagement is beneficial to child health and development, particularly as relates to child behavior problems.[30-34] What follows is a review of this literature.

Nonresident Father Engagement and Child Behavior Problems

Overall, the existing literature on nonresident father engagement and child behavior problems (e.g., stealing, fighting, destroying property, etc.) indicates that there is a negative association between nonresident father engagement and problem behavior in children.[24-29,41] Specifically, research suggests that as nonresident father engagement increases, child behavior problems decrease.[24-29,41]

Thomson et al. used data on 3,488 five-to eighteen-year olds from the National Survey of Families and Households to study the effect of father absence on child behavior problems in a 1994 study.[19] The authors found that children living in households without their father were more likely to have behavior problems compared to children living in households with their father.[28] However, the authors find that most of the differences in child health outcomes between children living in households with and without their fathers were explained by

differences in family incomes.[28] Specifically, households without fathers were found to have considerably lower incomes than households in which fathers were present, and these differences account for the majority of differences in child health outcomes.[28] The authors explain their findings by stating that, "Our analyses confirm much previous research showing that economic disadvantages of single-mother families account for much of disadvantages of children from these households.[28 (p 237)] Overall, the findings of this study indicate that living in a household without one's father is associated with poor academic achievement and behavior problems in children, but that most of this association can be explained by differences in incomes between households without fathers and households in which fathers are present.[28]

In 1999, author Aurora Jackson used data from 188 single Black mothers who were either current or previous welfare recipients and their three- to four-year-old children to assess the effect of nonresident father involvement on maternal depressive symptoms and child behavior problems.[20] The author found that frequency of child contact by nonresident fathers reduced maternal depressive symptoms and improved child behavior, but that this effect was mediated by mother's employment status.[31] Specifically, among employed mothers, maternal satisfaction with the amount of time in which father spent with their child was associated with reduced maternal depressive symptoms and improved child behavior.[31] Nonresident father contact with child was also associated with improved child behavior.[31] Among unemployed mothers, maternal dissatisfaction with the amount of time father spent with their child and maternal dissatisfaction with the amount of money father provided for their child were associated with increased maternal depressive symptoms.[31] However, nonresident father contact with children was not found to be associated with a change in child behavior. The authors summarize these findings by indicating that, "The data clearly suggest that maternal employment status seems to

make a difference in the relations of nonresident fathers with single black mothers and their preschool children...parallel analyses indicated that nonresident fathers seem to be less important in the lives of employed mothers."[31 (p163-64)] Overall, this study indicates that effect of nonresident father engagement among Black mothers and their children may be mediated by mother's employment.[31]

Choi and Jackson used data on 915 children from the Fragile Families and Child Wellbeing Study to assess the impact of father engagement on child behavior problems in a 20l1 publication.[21] In this study, the authors found that father engagement in activities such as reading books, playing games and singing songs was associated with a decreased risk of child behavior problems.[40] The authors find that nonresident father engagement improves the relationship quality between mother and father, and as a result, mothers are able to parent more appropriately, thereby producing an improvement in child behavior.[35] The authors indicate that, "The present findings suggest that nonresident fathers' involvement can benefit their children's behavioral development...[T]he indirect effects of the father-involvement variables on their children's behavior problems transmitted through mothers' parenting adequacy were significant."[40 (p 701)] The results of this study support previous findings which highlight the importance of the father-mother relationship in nonresident father engagement, and suggest that improved maternal parenting engendered by a positive relationship with child's father may be a mechanism by which child behavior is improved by engagement among nonresident fathers.[40]

The idea that nonresident father engagement may reduce child behavior problems by improving maternal parenting was also indicated by Jackson et al. in a 2013 study.[22] Using data on 99 single Black mothers and their three- to five-year-old children, the authors found that nonresident father engagement reduced maternal parenting stress depressive symptoms, which

resulted in improved maternal parenting and a reduced incidence of problematic child behaviors such as bullying, fighting and disobedience in school.[41] The authors summarize their findings by stating that, "We found protective effects of nonresident fathers' presence in the context of mothers' parenting stress and depressive symptoms that appeared to operate through decreases in the negative influences of these conditions and circumstances on the children's development of behavior problems over time."[41 (p 136)]

King and Sobelewski used data on 453 ten- to eighteen-year-olds to determine to the effect of nonresident father engagement on child behavior problems and in a 2006 study.[23] Here, the authors found that engagement among nonresident fathers was associated with improved child behavior, but that the effect was mediated by child's report of his/her relationship quality with his/her father.[28] The authors report that, "Having strong ties to the nonresident father alone is associated with fewer internalizing problems and less acting out at school... This is further evidence that strong ties to nonresident fathers can benefit child well-being."[28p (552)] In sum, the results of this study indicate that nonresident father engagement can be beneficial for child health outcomes, but that the relationship quality between father and child is an important factor.[28]

Nonresident Father Engagement and Child School Attendance

In general, the research on nonresident father engagement and child school attendance indicates that consistent engagement (i.e., scheduled and without periods of absence) from nonresident fathers improves school attendance in children, while little or inconsistent father engagement reduces school attendance.[31-36]

In a 2006 investigation, Menning, C. used data on 2,505 seventh- through twelfth-graders from the National Longitudinal Study of Adolescent Health to study the effect of nonresident father engagement on school absence.[24] The author found that higher nonresident father

engagement and increases in engagement over time were associated with a decreased risk of school absence due to dropout, expulsion, truancy and pregnancy.[35] The author states that, "[I]ncreased overall involvement and changes in this involvement over time are associated with a lower probability of school failure."[35 (p 1375)] However, the author also found that children who receive zero engagement from nonresident fathers have a lower risk of school absence that children with low levels of engagement.[35] The author reports that, "there is also evidence that adolescents who are completely uninvolved with their fathers have an advantage over their peers who experience low or even moderate levels of involvement, which supports the notion that fathers' involvement may introduce added complexities into [post-separation] dynamics between parents and their children."[35 (p 1375-76)] Overall, the findings of this study demonstrate that increased nonresident father engagement may reduce school absence, but that low or inconsistent levels engagement may be more detrimental than zero engagement.[35]

The finding that nonresident father engagement reduces school absence was echoed in a 2007 publication by Coley and Medeiros.[25] In this study, the authors used data on 647 ten- to fourteen-year-olds from the Welfare, Children and Families study.[36] The authors found that increased father-child contact and communication was associated with reduced school absence and delinquent behavior such as illicit drug use, stealing and cheating in school.[36] The authors report that, "The results indicated that greater involvement by nonresident fathers predicted relative decreases over time in adolescent delinquency...These findings replicate previous research suggesting that supportive and authoritative involvement by nonresident fathers is linked to more positive and productive behavioral functioning by adolescents."[36 (p144)] The findings of this study support previous research which indicates that nonresident father engagement reduces school absence and behavior problems in children.[36]

Nonresident Father Engagement and Child Substance Abuse and other Criminal Behavior

Although limited, the literature on nonresident father engagement and substance abuse and criminal activity in their children suggests that the relationship may vary by race and ethnicity. Specifically, engagement among White nonresident fathers was found to reduce substance abuse and criminal behavior in children, while engagement from Black nonresident fathers increased these delinquent behavior.[29]

In 1996, Thomas et al. used data on 600 adolescents to study the effect of nonresident father engagement on substance abuse and delinquency.[26] The authors found that adolescents whose nonresident fathers were not engaged experienced an increased risk of delinquent behaviors such as stealing, assault, gang fighting and credit card fraud compared to adolescents whose nonresident fathers were engaged.[29] The authors additionally found that effect of nonresident father engagement was modified by race and ethnicity and by child gender.[29] Specifically, the authors found that father engagement among White nonresident fathers was associated with reduced delinquency, heavy drinking and substance abuse among their male children but not their female children, whereas father engagement among Black nonresident fathers was not protective of any adolescent problem behaviors among female children, but rather increased them in male children.[29] In other words, the authors found that the effect of nonresident father engagement on adolescent male health and wellbeing among Whites fathers was opposite the effect of Black fathers, while neither was associated with health outcomes in adolescent females.[29] The authors summarize their findings by stating that,

> [T]he results indicate that nonresident father involvement buffers the negative effects in living in single mother-families for White male adolescents. However, for Black male adolescents, we find that, compared with those living with two biological parents and for those living with isolated single mothers, adolescents who live in single-mother families with nonresident fathers involved in their socialization reported higher levels of delinquency, heavy drinking and illicit drug use.[29 (p884)]

The results of this study suggest that differences may exist in the effect of nonresident father engagement on child health and behavior by father race and ethnicity and by child gender.[29]

Nonresident Father Engagement and Child Obesity

The small body of literature on nonresident father engagement and child obesity indicates that nonresident father engagement may increase obesity risk in children.[26]

A 2008 publication by Menning and Stewart found that nonresident father engagement was associated with an increased risk of child obesity.[27] In this study, the author used data on 1,983 seventh- through twelfth graders from the National Longitudinal Study of Adolescent Health to determine how father engagement in activities such as "working on school projects", "going shopping" or "going to the movies" affected child BMI percentile ranks.[26] The author found that while nonresident father engagement was protective against risk of child underweight, father engagement was associated with an increase in risk of child obesity.[26] The author reports that, "Results suggest that adolescents who are more involved with their nonresident fathers experience significantly higher odds of being obese (but not overweight) and lower odds of being underweight than their peers who are less involved."[26 (p 1683)] However, the authors additionally found that, amongst the most educated fathers, nonresident father engagement reduced obesity risk. The author explains that, "Those who were more involved with the most highly educated fathers were less likely to be obese. Specifically, a one standard deviation increase in involvement with fathers who had more than a 4-year college degree instead of less than a high school education reduces the relative risk of obesity by to nearly 1/20th of the risk."[26 (p 1685)] Overall, the results of this study indicate that nonresident father engagement may generally increase child obesity risk, but that the effect may be mediated by father education in that

engagement by highly educated fathers may be protective against the development of child obesity.[26]

Nonresident Father Engagement and Child Nutrition

My review of the literature did not identify any research which links fathers' residency to their children's physical activity or calorie intake. My review did find, however, evidence that nonresident father engagement improves reduces food insecurity and improves eating behaviors in children.

A 2009 study by Stewart and Menning used data on 3,745 seventh- through twelfth graders from the National Longitudinal Study on Adolescent Health to study the effect of nonresident father engagement on child eating behaviors.[28] The authors found that children living in single-parent households were more likely to display unhealthful eating habits such as skipping breakfast and lunch, eating fewer vegetables, consuming more fast food, and having less parental monitoring of meals than children living in two-parent households.[27] The authors also found that nonresident father engagement in activities such as helping with school work, going shopping and going to the movies was associated with an increased frequency of eating breakfast, lunch and consumption of vegetables.[27] However, nonresident father engagement did not affect adolescents consumption of fast food.[27]

A 2007 study by Garansky and Stewart found that nonresident father engagement reduced the risk of food insecurity experienced by their children.[29] Using a sample of 7,861 children from the National Survey of American Families, the authors found that, "frequent—more than once a week—visits by the father reduce the likelihood that the focal child's resident family will experience episodes of food insecurity."[28 (p108)]

The finding that nonresident father engagement reduces child food security was also found in a 2014 publication by Nepomnyaschy et al.[30] Analyzing a sample of nearly 10,500 children from the Early Childhood Longitudinal Study, the authors found that nonresident father involvement reduced child food insecurity. However, the authors find that the reduction in child food insecurity was most strongly associated with father's provision of "in-kind" support (e.g., purchased clothes, diapers, toys; paid for child care or health insurance, etc.) as opposed to father's contact with child: "We find the most consistent evidence for the protective effect of fathers' provision of in-kind support...We find no evidence of the protective effect of fathers' contact with children".[32 (p123)] In summary, the literature on nonresident father engagement and child wellbeing indicates that engagement among nonresident fathers reduces behavior problems in children.[34-41] There is evidence that nonresident father engagement improves the relationship quality between mother and father, which results in reduced maternal parenting distress, thereby allowing mothers to parent more effectively which improves child behavior.[46] There literature on nonresident father engagement and child obesity risk is limited and mixed. A section of literature indicates that nonresident father engagement increases child obesity risk, with the exception of higher educated fathers, whose engagement was found to reduce obesity risk.[29-30] Another section of the literature finds that nonresident father engagement improves child eating behaviors reduces the risk of child food insecurity, however, the pathway through which these outcomes are achieved (i.e., through direct contact with the child or through provision of in-kind support) remains unclear.[31-32]

I.e. Public Policy Response

This issue of nonresident fatherhood has been primarily addressed through public policy in two main categories, 1) healthy marriage programs and 2) responsible fatherhood programs.

I.e.i. Healthy Marriage Programs

In 2001, The Administration for Children and Families (ACF) at the U.S. Department of Health and Human Services established the Healthy Marriage Initiative, which awards grants to states, local governments, and community based organizations to promote healthy marriage programs.[31] These programs are usually run by organizations or agencies seeking to support marriage in a certain geographic area or target population.[40] There are currently 60 grant-funded healthy marriage programs nationwide, each of which operating within a share of the of $75 million annual budget for the Healthy Marriage Initiative.[32] Healthy marriage programs may include any or all of the following:[41]

- Public advertising campaigns on the value of healthy marriages.
- Education in high schools on the value of marriage, relationship skills, and budgeting.
- Marriage and relationship skills programs that may include parenting skills, financial management, conflict resolution, and job and career advancement.
- Premarital education and marriage skills training for engaged couples and for couples or individuals who are interested in marriage.
- Marriage mentoring programs that use married couples as role models and mentors in at-risk communities.
- Divorce reduction programs that teach relationship skills.
- Programs to reduce the disincentives to marriage in means-tested aid programs, if offered in conjunction with any activity described above.

Overall, healthy marriage programs have had a negligible impact on establishing and sustaining healthy marriages and relationships. The Building Strong Families Project (BSF) was designed to assess how healthy marriage programs affected low-income, unmarried couples who were pregnant or who had young children.[33] A recent review by Mathematica Policy Research found that, "After three years, BSF had no effect on the quality of couples' relationships and did not make couples more likely to stay together or get married."[13 (p xiii)]

The Community Healthy Marriage Initiative (CHMI) was created to identify how community-based healthy marriage programs fared in improving relationship skills and

increasing healthy marriages within communities.[34] A final report from the Office of Planning, Research and Evaluation (OPRE) at ACF revealed that "the initiative did not result in changes in relationship and family outcomes."[14 (p7-3)]

The Supporting Healthy Marriage evaluation (SHM) was designed how healthy marriage programs impacted low-income married couples.[35] Although SHM indicated that healthy marriage program participants experienced slightly less abuse and psychological distress, "The program did not significantly affect whether couples stayed married at the 12-month follow-up point."[15 (p v)]

Overall, the existing evidence indicates that healthy marriage programs have been largely ineffective in establishing or sustaining successful relationships and marriages.[13-15]

I.e.ii. Responsible Fatherhood Programs

In 2006, specific funding provisions for fatherhood programs were added to the Healthy Marriage Initiative, which is now called the Healthy Marriage and Responsible Fatherhood Initiative.[36] Responsible Fatherhood programs are designed to encourage three main outcomes: 1) healthy marriage, 2) responsible parenting and 3) economic stability.[37] There are currently 55 Responsible Fatherhood programs operating within a $75 million shared annual budget nationwide.[37] Grant monies for Responsible Fatherhood programs may used to promote the following activities:[37]

1. Healthy Marriage – Activities to promote marriage or sustain marriage through activities, such as:
   - Providing information about the benefits of marriage and two-parent involvement for children.
   - Enhancing relationship skills.
   - Education regarding how to control aggressive behavior.
   - Disseminating information on the causes of domestic violence and child abuse.
   - Marriage preparation programs and premarital counseling.
   - Skills-based marriage education.
   - Financial planning seminars.

- Divorce education and reduction programs, including mediation and counseling.

2. Responsible Parenting – Activities to promote responsible parenting, such as:
   - Counseling, mentoring, and mediation.
   - Disseminating information about good parenting practices.
   - Teaching parenting skills.
   - Encouraging child support payments.

3. Economic Stability – Activities to foster economic stability, such as:
   - Helping fathers improve their economic status by providing activities such as job training, employment services, and career-advancing education.
   - Coordination with existing employment services such as welfare-to-work programs, referrals to local employment training initiatives.

Overall, evidence indicates that responsible fatherhood programs have been moderately successful. The Parents' Fair Share (PFS) project was a national responsible fatherhood program conducted from 1994-1996 that combined job training and placement, peer support groups, and other services with the goal of increasing the earnings, child support payments and parenting quality of unemployed noncustodial fathers of children on welfare.[16] A recent analysis by the Congressional Research Service (CRS) found that, "the program did not significantly increase employment or earnings among the full sample of PFS participants during the two years after they entered the program."[16(p 6)] However, the CRS report found that, "the program did increase earnings among a subgroup of men who were characterized as "less employable" (i.e.,, those without a high school diploma and with little recent work experience)."[16(p 6)]

ACF evaluated responsible fatherhood programs in eight states from 1997-2002.[16] These programs sought to improve the employment and earnings of under- and unemployed nonresident fathers, and to motivate them to become more financially and emotionally involved in the lives of their children.[16] An assessment by the CRS indicates that, "[E]mployment rates and earnings increased significantly, especially for noncustodial parents who were previously unemployed. In addition, child support compliance rates increased significantly, especially for

those who had not been paying previously."[11(p 8)] The CRS report also found that, "27 percent of the fathers reported seeing their children more often after completion of the program."[16(p 8)]

Partners for Fragile Families (PFF) was a responsible fatherhood program operating in nine states which helped young (age 16-25) nonresident fathers to secure employment, health, and social services; make child support payments; learn parenting skills; and work with the mothers of their children to build stronger parenting partnerships.[16] A recent report by the CRS indicates that the program had only mild effects on the earnings of nonresident fathers.[16] Specifically, "Although quarterly earnings of PFF participants increased after enrollment in the demonstration, at the end of 12 months, participants generally had poverty-level incomes."[16(p 9)] However, the PFF program was highly effective in securing child payments.[16] The CRS report states that,

> At enrollment, about 14 percent of PFF participants had a child support order, whereas two years after enrollment, 35 percent of PFF participants had a child support order. For those PFF participants who paid child support, the average child support payment was $1,569 for the first year after enrollment and $2,296 for the second year after enrollment. The report also noted that, on average, about five monthly child support payments were made in the first year after enrollment and about seven monthly payments were made in the second year after enrollment.[11(p 9)]

In general, the existing evidence on responsible fatherhood programs suggest that these programs may be most effective in improving the employment and earnings of unemployed fathers and those with less than high school education.[16-17] Although there is limited evidence which suggests that these programs improve nonresident father visitation and engagement with their children, there is consistent evidence that responsible fatherhood programs improve child support compliance among noncustodial fathers.[16-17]

Overall, the policy response to the increase in nonresident fathers and children living in households without their fathers has been ineffective in reversing the trends indicated in Figures 1 through 5.[11-17] Thus, these policies has been ineffective in nonresident father prevention.

However, there is some evidence that this policy response has been effective in treating the conditions posed by nonresident fatherhood, in that responsible fatherhood programs have been effective in increasing the employment and earnings of the most disadvantaged fathers, and have also been successful in improving child support compliance.[11-17]

It is important to note that, despite the improvements in child support compliance indicated by some fatherhood programs, both healthy marriage and responsible fatherhood programs are public policy initiatives which primarily seek to promote father engagement and increase family stability, and are not responsible for addressing the consequences posed by fathers living away from their children.[40,45] The consequences posed by fathers living away from their children has been primarily addressed by securing financial support from fathers in the form of child support payments, which fall under the jurisdiction of the Office of Child Support Enforcement (OCSE) child support program.[38] Congress established the OCSE child support program in 1975 to reimburse benefits paid by the government's welfare programs to single parents and their children.[46] However, in 1998, Congress began funding the child support program based on its performance, as opposed to welfare expenditures, thereby incentivizing the program for securing payment from noncustodial parents regardless of their child's use of public benefits.[46] In fiscal year 2010, the program collected $27 billion from noncustodial parents, 82 percent of whom were fathers.[46,39] As this thesis focuses on the social engagement of nonresident fathers, child support payments rest outside its aim and scope, nonetheless, it is important to indicate that the provision of fathers' social support has been received considerably less attention compared to fathers' financial support. For instance, healthy marriage and responsible fatherhood programs are each funded at $75 million annually, compared to the 2010 figure of $27 billion collected the child support program.[40,46,47]

I.f. Gaps in the Literature

Each of the three aims within this thesis addresses a critical gap in the existing literature. The first aim, which describes patterns of father's engagement with their children among resident and nonresident fathers, contributes to the literature by incorporating the most recent data available from the Fragile Families study (the year-9 data). In addition, this aim also compares patterns of engagement by a variety of individual engagement activities with early adolescents, representing one of the first studies of its kind to examine father engagement in this way among Black and Hispanic fathers. In so doing, this aim represents a unique contribution to literature by answering the question of "How do the patterns of engagement between resident and nonresident Black and Hispanic fathers compare, based on the nature of the engagement activity?"

The second aim, which examines whether father's engagement is associated with their children's academic achievement, contributes to the literature by quantifying how paternal behavior may account for racial and ethnic disparities in child academic achievement. More specifically, Black and Hispanic adolescents (and young adults) have disproportionately lower rates of high school completion, college enrollment and college completion compared to other race and ethnicity groups.[5] Blacks and Hispanics adolescents are also more likely to live in households without their fathers compared to other races/ethnicities.[6] This second aim represents a unique contribution to the literature in that it quantifies the impact that nonresident fatherhood may have on racial and ethnic disparities in academic achievement. This aim does not seek to identify whether racial or ethnic differences exist in the relationship between nonresident father engagement and child academic achievement; rather, it seeks to quantify the impact of nonresident father engagement overall, which has profound implications given the aforementioned differences in educational attainment.[5,6]

Similarly, the third aim, which examines whether father's engagement is associated with their children's obesity risk, contributes to the literature by quantifying how paternal behavior may account for racial and ethnic disparities in child obesity risk. In particular, Black and Hispanic children have disproportionately higher rates of overweight and obesity compared to other races and ethnicities.[6] As stated previously, Blacks and Hispanics children are also more likely to live in households without their fathers compared to other races/ethnicities.[7] This third research aim represents a distinct contribution to the literature in that it quantifies the impact that nonresident fatherhood has on disparities in child obesity risk.

In combination, this thesis also contributes to the literature by using a new method of measuring father's engagement based on the most recent year-9 (focal child's age) data from the Fragile Families study. Most prior studies have used data from year-5, and have combined measures of engagement such as "eating meals with child", "going to the movies with child", or "talking about homework with child" into an overall composite measure or summary score of father engagement, thus aggregating father engagement over a broad range of potentially unrelated activities. Although there are methodological advantages to this approach, such as an increase in internal validity and external reliability, this approach may mask important differences by activity type.[71] For example, the direction of the relationship between father's engagement and the various activities may not always move in the same direction. As a result, combining into a single measure could lead to regression towards the mean.[72] There may be racial/ethnic preferences about the frequency of father's engagement in various activities which may be masked in aggregate analyses. This analysis considers father's engagement with their children overall *and* by specific activity type in order to identify whether the association differs by the type of activity. As the nature of activities in which parents engage with their children

change over time (e.g., from changing diapers in infancy to helping with homework in adolescence) not all activities are consistent across all years.[73] However, there were two activities−reading books and playing games−that were measured across all the age categories within this study.

A final contribution of this thesis is its contribution to public policy. If this thesis finds that nonresident father engagement is associated with higher academic achievement and/or reduced obesity risk in children, it could help lend support for shared parenting policies in states which currently do not have a presumption of shared-parenting in instances of non-marital child birth and divorce.

I.g. Study Hypotheses

The following hypotheses are based on the findings within the prevailing public health and social sciences literature.

For Aim 1, I expect to find that resident fathers will have statistically significant higher levels of engagement in all activities compared to nonresident fathers. This hypothesis is based on the body of literature which indicates that resident fathers are more likely to be engaged with the children compared to nonresident fathers.[13-16] I also expect to find nonresident father engagement to vary according to race/ethnicity. Specifically, I expect to find that White fathers will have higher levels of engagement because evidence indicates that White fathers tend to have higher levels education and higher incomes compared to Black or Hispanic fathers;[40] both education and income have been found to be positively associated with father engagement.[19-22]

In Aim 2, I expect to find that among nonresident fathers, those who are engaged with their children (compared to those who are not engaged) will have children with higher academic achievement, regardless of race. This hypothesis is based on the body of research which indicates

that nonresident father engagement is associated higher academic achievement, fewer behavior problems in school and lower school truancy among their children.[34-41]

Within Aim 3, I expect to find that among nonresident fathers, those who are engaged with their children (compared to those who are not engaged) will have children a lower risk of child obesity. This hypothesis is based on the literature which indicates that nonresident father engagement reduces the risk of child food insecurity.[31-32] Evidence indicates that food insecurity represents a systemic trigger for obesity risk, and is a of the primary contributor to the disproportionately higher risk of obesity among Black and Hispanic populations.[41]

I.h. Theoretical Framework

This thesis is guided by the social-ecological model which theorizes that individual behaviors and outcomes are influenced a variety of interrelated societal, community, interpersonal, and individual factors.[42] One of the defining features of the model is that individual behaviors and outcomes cannot be considered in a vacuum− individuals have to be considered within the environment in which they live.[41] Outcomes are also affected through various interactions (which occur within levels) and feedback mechanisms (which occur between levels).[41]

As Figure 6 demonstrates, Healthy Marriage programs, Responsible Fatherhood programs, child custody laws, and child support policy can be considered as broader societal factors within this model. In general, when parents are not married to each other at the time of a child's birth, unmarried mothers are presumed to have primary physical and legal custody of the child, and their custody is upheld in the majority of court proceedings (particularly in cases outside of neglect and abuse, and in cases where the child's father is not listed on the birth certificate).[43,44] Thus, nonresident fathers−the majority of whom were not married to their child's

mother at the time of birth[10,11]−face a barrier to child engagement by default. As child support policy mandates financial contribution of noncustodial parents, nonresident fathers may also face being regarded primarily as financial supports to their child as opposed to social supports.[66] Healthy Marriage programs (which seek to prevent resident fathers from becoming nonresident fathers) and Responsible Fatherhood programs (which aim to increase engagement among nonresident fathers) play a role in counteracting the aforementioned effects of child custody laws and child support policy.[67]

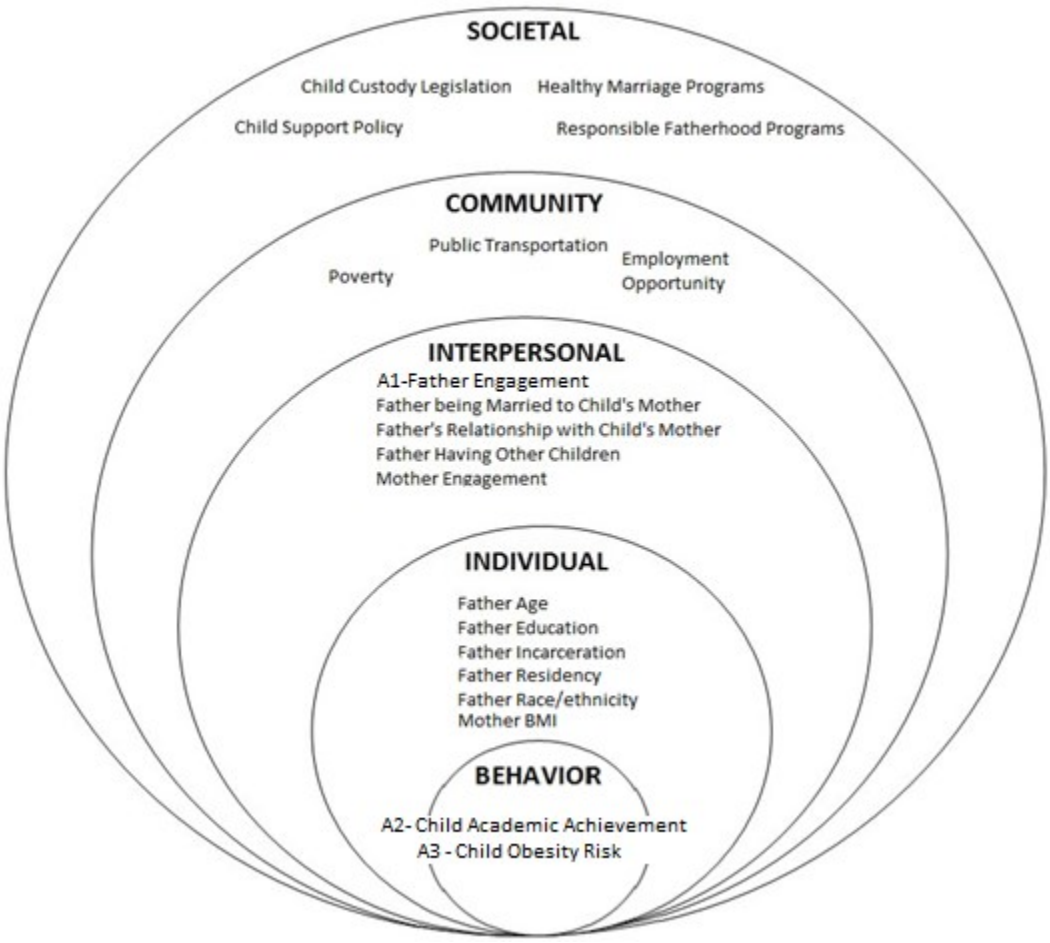
Poverty, public transportation, and employment opportunities represent some of the more salient community-level contributors. As child support policy requires nonresident fathers to support their children financially,[66] employment opportunity−and having a viable means to commute to that opportunity−are important determinants of father engagement. Research indicates that fathers who support their children financially have better relationships with their child's mother, which in turn is associated with higher levels of father engagement.[19-22]

As indicated by Figure 6, a number of important interpersonal factors are present within this model. In addition to the aforementioned importance of father's relationship with child's mother, father having other children (and the financial and social requirements therein) also yields a significant impact and engagement.[18-22]

Evidence suggests that the individual-level impacts that may have the largest impacts on the outcomes of interest include father race/ethnicity, father education, mother BMI.[20,22-23] Father/race ethnicity is important because it predicts child race/ethnicity, which is associated with both outcomes of interest within this model, academic achievement and obesity risk.[19-21] In addition, father education is an important determinant of child academic achievement, while mother's BMI is a key contributor to child obesity risk.[20-22]

This thesis will focus on how the two most proximal levels of the model— interpersonal factors and individual factors—influence individual behavior.

Figure 6. Social Ecological Model for Father Engagement and Child Health and Wellbeing



II. CHAPTER TWO: METHODOLOGY

II.a. Data

The data for this thesis come from the Fragile Families and Child Well-being Study (hereafter referred to as "Fragile Families"), a national longitudinal study of 4,898 mostly unmarred parents and their children living in urban environments in the U.S..[45] The sample is comprised of births occurring between 1998 and 2000 from twenty U.S. cities, and is

representative of all non-marital births in the U.S. to parents residing in cities with populations over 200,000 (this includes 113 U.S. cities).[43,46] The study was designed to investigate the conditions and capabilities of low-income unmarried parents, and how children born into these families fare.[43]

The Fragile Families Study follows families−mothers, fathers and their child−from their child's (the focal child) birth through age nine. The focal child is defined as the child on whom the Fragile Families study is based (i.e., the child born to mothers between 1998 and 2000) Mothers were interviewed in-person at the hospital within forty-eight hours after giving birth, and fathers were interviewed either at the hospital or elsewhere as soon as possible after the birth. These interview lasts approximately one hour in length, and consisted of questions about parent's demographics (e.g., age, race/ethnicity, education, income), their relationship (e.g., marital status, cohabitation status, relationship quality), their health (e.g., medications, depression), their health behavior (e.g., smoking, substance abuse, sexual history), their family history (e.g., parent's demographics), their personal beliefs/values (e.g., religious and political views, views on marriage), their views on parenting and other related personal information (e.g., incarceration history, children from other relationships).[43]

Four follow-up interviews were conducted when the focal child was one-, three-, five-, and nine-years old.[43] For mothers, the follow-up interviews consisted of a telephone-interview and, for mothers who lived with their children (over 97 % of mothers) an in home-assessment of the child's living environment.[43] The telephone-interview consisted of the same categories of questions from the hospital interview.[43] The in-home observations were conducted consisted of interviewer ratings of the child's home, the child's behavior and appearance during that visit, the child's interaction with his/her mother and family during that visit, the behavior and appearance

of other persons inside the home during that visit and related observations. At age nine, the in-home observations included in-person physical measures of height and weight of both mother and child.[47] In addition, nine-year-olds were administered tests to assess their academic achievement (The Woodcock Johnson Tests of Academic Achievement, the Peabody Picture Vocabulary Test, and the Wechsler Intelligence Scale Digit Span Test).[38] For fathers, follow-up interviews consisted of telephone-interviews of the same categories of questions which were asked during the hospital interview.[43] Outside of the in-person physical measures of height and weight, all of the survey responses are based on self-report.[43]

The Fragile Families Study is uniquely suited to address the aims of this thesis based on its emphasis on low-income, unmarried fathers.[43] In this sample, a third (31 %) of the fathers were nonresident at child's birth, which is higher than any other comparable study.[43] This large sample allows for comparisons by residency status. In addition, the collection of data directly from parents (as opposed to other household members) on measures concerning their education, relationship quality, and engagement with their children is one of the major strengths of the dataset that represents an improvement over other national survey datasets such as the National Longitudinal Survey of Youth, the National Survey of Families and Households, and the Panel Study of Income Dynamics.[43] In short, "The Fragile Families and Child Well-being Study is providing the most complete data on unwed fathers to date and is doing so for a nationally representative sample".[43 (p 307)]

Measures

Table 2 describes the measures used in each of the study aims. They are described in detail below:

Table 2. Dependent variables, independent variables, control variables and years of Fragile Families data used by, study aim.			
Study Aim (years of data)	Dependent/Outcome Variable	Main Independent Variables of Interest	Control Variables/Covariates
1 (baseline, years 1, 3, 5 and 9)	Father Engagement	Father Residency; Father race/ethnicity	Father age, Father education, Father incarceration status, Father relationship with child's mother, Father married to child's mother, Father has other children, Child gender, Mother engagement
2 (baseline, years 1, 3, 5 and 9)	Child Academic Achievement	Father Engagement	Father age, Father education, Father incarceration status, Father relationship with child's mother, Father married to child's mother, Father has other children, Child gender, Mother engagement
3 (year 9)	Child Obesity Risk	Father Engagement	Father age, Father education, Father incarceration status, Father relationship with child's mother, Father married to child's mother, Father has other children, Child gender, Mother engagement, Mother BMI

II.a.i Measure of Dependent Variables

There are three dependent (outcome) variables within this study, each of which being linked to a specific research aim. The dependent variable for Aim 1 is father engagement, and the dependent variables for Aims 2 and 3 are child academic achievement and child obesity risk respectively.

Aim 1: Father Engagement

Father engagement was measured using items from Home Observation for Measurement of the Environment (HOME) scale in the Fragile Families Study.[48] The HOME Scale is designed to measure the quality and quantity of stimulation and support available to a child in the home environment, and is typically used to assess the effects parental engagement and other in-home influences on child health, behavior and development.[49,50] The decision to use the HOME scale as measure of father engagement is based on its established validity and reliability in the measure of father engagement; it is commonly used throughout the father engagement literature.[51] A recent review of the HOME scale explains that,

> HOME is without doubt the most commonly used environmental assessment instrument in developmental research. Many years of research have demonstrated the important correlations it has with measures of cognitive and language development and its ability to independently predict such outcomes later in the child's life. Most importantly, however, research has proved the instrument's validity in describing the home environments of children at risk and revealing the effect of home experiences in developmental outcomes.[51 (p33)]

At each follow-up interview, parents were asked about the frequency in which fathers engaged in activities with child.[51,52] A complete list of the activities used to assess father engagement during each follow-up interview is listed in Table 2. Fragile Families used age-appropriate activities from the HOME scale in assessing father engagement.[48,49] For example, at age one, parents were asked questions such as, "How many days per week does father change child's diaper?" and "How many days per week does father sing songs or nursery rhymes to child", whereas, at age 9, parents were asked question such as, "How often does father watch TV with child?" and "How often does father play sports with child?".[48,49]

Because Fragile Families used age-appropriate activities to assess father engagement, only two measures of engagement were consistent from age 1 to age 9, "How many days per week does father read books with child?" and "How many days per week does father play inside

with child?"[48,49] Thus, comparisons in father engagement over time were conducted using these two measures of father engagement. The full range of activities used to assess father engagement is presented in Table 3.

Table 3. Activities used to asses father engagement in Fragile Family follow-up interviews, by age of focal child.

Activity	Age 1	Age 3	Age 5	Age 9
Play games	●	●		
Sing songs	●	●	●	
Read books	●	●	●	●
Tell stories	●	●	●	
Play inside	●	●	●	●
Change diaper	●			
Hug	●	●		
Help with chores		●		●
Play outside			●	●
Watch TV			●	●
Take to event			●	
Talk about day				●
Play video games				●

SOURCE: Fragile Family and Child Wellbeing Study.

In this thesis, father engagement is based on mother report of frequency father participates in activities with child. Mothers' report was used for four main reasons. First, there is a much higher survey response rate among mothers compared to fathers, particularly among nonresident fathers, so basing father engagement on mothers' report allows for a much larger sample size and statistical power. The response rates for mothers and fathers are illustrated in Table 4 and Table 5.

Table 4. Response rate for all parents within the Fragile Families study, by age of focal child.[a]

	n (%)[b]				
	Birth	Age 1	Age 3	Age 5	Age 9
Mothers	4,898 (100%)	4,364 (89%)	4,231 (86%)	4,139 (85%)	3,515 (72%)
Fathers	3,766 (77%)	3,287 (67%)	3,165 (65%)	2,993 (61%)	2,421 (49%)

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Percent out of 4,898. The baseline sample size for the Fragile Families study is 4,898.

Table 5. Response rate for nonresident fathers and their child's mother within the Fragile Families study, by age of focal child.[a]					
	n (%)[b]				
	Birth	Age 1	Age 3	Age 5	Age 9
Mothers	1,852 (100%)	1,711 (100%)	1,972 (100%)	2,248 (100%)	2,045 (100%)
Fathers	1,151 (62%)	959 (56%)	1,145 (58%)	1,388 (62%)	1,187 (58%)

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Percent out of total number of nonresident fathers as indicated by mothers who reported that father was nonresident during that particular follow-up survey.

Second, due to the high attrition rate among fathers, it is likely that only the most motivated, capable and engaged fathers remain in the study over time, thereby creating a nonresponse bias.[53] A recent study on measures of father engagement by Hernandez and Coley indicates that, "Nonresponse bias can arise when participants in a study differ from those who do not participate. Fathers who participate in a study may be more involved and stable than nonparticipants, and hence the data may over-represent positive involvement."[50 (p5)] Third, even among fathers who are typical and representative, a self-serving bias may result in an over-estimation of actual levels of engagement due to fathers' wishes to provide more socially desirable responses.[50] Authors Hernandez and Coley explain that, "[F]ather reports of their own behaviors may be influenced by a self-serving bias... father reports may be biased upward, influenced by new conceptions of engaged fathering."[50 (p5)] The fourth and final reason why this thesis used mothers' report of father engagement is because research demonstrates that mother reports are valid and reliable indicators of father engagement activities.[45] As Hernandez and Coley reveal, "[R]esults suggest that the use of mother reports of father involvement produce composites that show reliability and validity strengths statistically indistinguishable from composites created with fathers' reports of their own involvement." The authors summarize the findings of their study by concluding that. "[T]hese findings suggest that concerns over the use

of mother report data on basic aspects father involvement may be overstated. The use of maternal survey reports of father involvement appears to be a defensible practice."[50 (p28)]

At the one-year, three-year and five-year follow-up surveys (i.e., when the focal child was one-, three-, and five-years-old), mothers were asked the frequency in which father engaged in activities within a typical week (e.g., "How many days per week does father usually read books with child?"). Mothers could then respond with an answer ranging from "zero" to "seven" days per week. At the nine-year follow-up survey (when the focal child was nine-years-old), mothers were asked the frequency in which father engaged in activities with child within the past month (e.g., "How often did father play sports with child in the past month?"). Mothers could then respond with an answer of "not once", "one to two times", "once a week", "several times a week" or "everyday".

In order to make the measures of father engagement at ages one, three, and five comparable to the measures at age nine, engagement was converted to a binary measure of "at least one day per week" versus "less than one day per week". To illustrate, for the weekly measures of engagement at ages one, three and five, responses of "zero" were coded as "less than one day per week", while responses of "one" through "seven" were coded as "at least one day per week. For the monthly measures of engagement at age nine, responses of "not once" and "one to two times" were coded as "less than one day per week", whereas the responses of "once a week", "several times a week" and "everyday" were coded as "at least one day per week". Thus, fathers are considered "engaged" if they participated in the particular activity at least one day per week, and "not engaged" if the participated in the said activity less than one day per week.

Summary scores for father engagement were generated based on the activities specific to each follow-up survey. The summary scores indicate whether fathers engaged in "any" or "all"

of the said activities with their child at least one day per week. Summary scores could range from "0" to "7", with a score of "0" indicating no weekly engagement, while a score of "7" indicating full engagement. All measures of father engagement are defined in a binary fashion based on father being engaged in said activity/activities with child at least one day per week (Engaged, Not engaged).

Aim 2: Child Academic Achievement

Child academic achievement was assessed using the Woodcock-Johnson III Tests of Achievement (WJ-III), a validated and commonly used measure of scholastic aptitude in early adolescence.[54] The WJ-III measures achievement in reading, math, written language, oral language, and knowledge.[55] The WJ-III was co-normed on 8,818 individuals consisting of 1,143 preschoolers, 4,784 school-age children (Kindergarten through 12th grade), 1,165 college students, and 1,843 adults.[57] The norm group included a wide variety of individuals, including students attending public, private, and homeschooling, students with disabilities, and English language learners who had at least one year or more of experience in English-speaking classes. In total, thirteen different socioeconomic-status variables were accounted for, as well as ten specific community and individual variables.[57] Internal consistency reliabilities range between 0.81 and 0.94.[57]

Fragile Families administered WJ-III tests of reading achievement and math achievement to children during the age 9 in-home assessments.[51] Each tests takes approximately 5 minutes to complete.[56] The WJ-III reading test involves symbolic learning, or the ability to match a rebus (pictograph representation of a word) with an actual picture of the object.[58] The next items are presented in a multiple-choice format and require the individual to point to the picture represented by a phrase.[58] The remaining items require the person to read a short passage and

identify a missing key word that makes sense in the context of that passage. The items become increasingly difficult by removing pictorial stimuli and by increasing passage length, level of vocabulary, and complexity of syntactic and semantic cues.[58] The WJ-III math test requires the focal child to analyze and solve math problems.[58] To solve the problems, the focal child must listen to the problem, recognize the procedure to be followed, and then perform relatively simple calculations.[58] Because many of the problems include extraneous information, the focal child must decide not only the appropriate mathematical operations to use but also which numbers to include in the calculation.[58] Item difficulty increases with complex calculations.[51] The raw reading achievement and math achievement scores were converted into standardized scores by Fragile Families.[51] The interpretations for the full range of standardized scores is listed in Table 6.

Table 6. Interpretation of WJ-III Standardized Scores for Reading and Math.

Interpretation	Score Range
Very Superior	131 and above
Superior	121–130
High Average	111–120
Average	90–110
Low Average	80–89
Low	70–79
Very Low	55–69
Intellectually Deficient	less than 55

SOURCE: Mather N and Jaffe L. Woodcock-Johnson III: Reports, Recommendations, and Strategies. 2002.

Child reading and math achievement were each defined in a binary fashion (Below average/less than score of 90, Average or above/at least score of 90) and by mean test scores, based on the measures of academic achievement used within the existing literature.

Aim 3: Obesity Risk

Measures of overweight and obesity are based on in-home physical measures of height and weight.[57] This is important because physical measures of height and weight are more valid and reliable than self-reported measures,[58,59] and is a major advantage of the Fragile Families Study. Fragile Families collected measures of height and weight from the focal child and the focal child's mother during the in-home interview follow-up surveys at ages 3, 5 and 9.[60] Fragile Families did not collect measures of height and weight on the focal child's father, primarily because the majority of fathers were not present during the in-home interviews, especially if the father was nonresident.[48]

Child's body mass index (BMI) was calculated by dividing the weight in kilograms by the height in meters squared. Child's BMI was converted into BMI percentiles using the standardized measurements from the Center for Disease Control's (CDC) SAS programs.[51] These programs generate a dataset that contain indices of the anthropometric status of children from birth to 20 years of age based on the 2000 CDC growth charts. These conversions were done Fragile Families and are available in the dataset.[51] Child overweight is defined as a BMI at or above the 85th percentile and lower than the 95th percentile for children of the same age and sex on the CDC BMI-for-age growth charts.[61] Child obesity is defined as a BMI at or above the 95th percentile for children of the same age and sex on the CDC BMI-for-age growth charts.[55] Child overweight and obesity were each defined in a binary fashion (Overweight, Not overweight; Obese, Not obese).

II.a.ii. Main Independent Variables of Interest

There are three main independent variables of interest within this study, father residency, father race/ethnicity and father engagement. Father residency and father race/ethnicity are the

two main independent variables of interest for the Aim 1, and father engagement is the main independent variable of interest for Aim 2 and Aim 3.

Aim 1: Father Residency

Father residency and father race/ethnicity are the two main independent variables of interest for Aim 1, which seeks to a) identify the association between father residency and father engagement, and b) identify whether this association differs by race/ethnicity.

Father residency was based on mother report of parent's cohabitation status. Specifically, at the baseline interview (in the hospital after the child's birth), and during each follow-up interview (when the child was one-, three-, five-, and nine-years-old), mothers were asked, "Are you and [child's father] currently living together?"[50] Possible responses included "Yes" and "No". Fathers' residency status was defined in a binary fashion (Yes, No) based on the data.

Father race/ethnicity is based on father report. At baseline, fathers were asked, "What is your race?" Possible responses were, "Black", "White", and "Other". For fathers who responded "Other", the subsequent question of, "What is your ethnicity?" was asked. Possible responses were, "Hispanic" and "non-Hispanic". Father's race was defined categorically (non-Hispanic Black, Hispanic, non-Hispanic White, Other) based on the measures of father race/ethnicity within the existing literature.

Aim 2 and Aim 3: Father Engagement

Father engagement is the main independent variable of interest for Aim 2 and Aim 3. A complete description is described previously in section II.a.i Measure of Dependent Variables: Father Engagement.

II.a.iii. Control Variables

The following control variables (covariates) were included based on the existing literature (detailed below), regardless of statistical significance. Except for mother's BMI, all control variables are based on self-report, and were assessed during the baseline in-hospital interview and the follow-up interviews when the child was one-, three-, five, and nine-years old.

Father's Age

Research suggests that father's age may influence patterns of engagement in that younger nonresident fathers are more likely to be engaged with their children than older nonresident fathers.[8] Research indicates that most nonresident fathers and their child's mother establish new romantic relationships and have additional children.[62] These new family responsibilities make it difficult for older nonresident fathers to maintain engagement with children from previous relationships.[59]

At baseline, and during each follow-up interview, fathers were asked, "What is your age?" Possible answers included father's age in years. Father's age was defined in a binary fashion (Less than 30 years, 30 years or more) based on the sample means and measures of father age within the existing literature.

Father's Education

Evidence indicates that fathers who are more educated are more likely to be involved in their children's lives.[8] Higher education is associated with higher income, which corresponds with higher child support compliance, better relationship quality and a better ability to finance father engagement (travel, food, activities, etc.) among nonresident fathers.[59] In this thesis, father's education is used as an indicator of father's socioeconomic status due to a high level of missing values (over 50 %) among variables which assess father's income. In addition, research

demonstrates that self-reported measures of income can be inaccurate.[63] The use of father's education as an indicator of father's socioeconomic status in this thesis is consistent with the existing research on father engagement, especially amongst those studies relying on data from the Fragile Families study.[59]

At baseline, fathers were asked, "What is the highest grade of school that you have completed?" Possible responses were, "No formal education", "Less than 8th grade", "Some high school", "High school diploma", "GED", "Some college", "Technical or trade school", "Bachelor's degree", "Graduate degree". At each follow-up interview, fathers were asked, "Have you completed any education since the last interview?" Possible responses were "Yes", followed by corresponding level of education, and "No".

Father's education was defined categorically (Less than high school, High school/GED, Some college or more) based on sample means and the measures of father education within the existing literature. *Father's Incarceration Status*

Research indicates that fathers who are incarcerated are less likely to be engaged with their children.[64] Because the Fragile Family survey instruments asked about fathers' "usual" or "typical" engagement with child, as opposed to fathers' "current" engagement, fathers who were incarcerated were not excluded from the sample.

At baseline, and during each follow-up interview, mothers were asked, "Is father currently in jail?" Possible responses were, "Yes" and "No". For fathers who were indicated as being in jail, Fragile Families contacted the corrections facility were father was held, and conducted baseline and follow-up interviews as permitted. Fewer than five percent of fathers were incarcerated during interviews.

Father's incarceration status was defined in a binary fashion (Incarcerated, Not incarcerated) based on the measures of father incarceration within the existing literature.

Father's Relationship with Child's Mother

Evidence indicates that fathers who have a positive relationship with their child's mother are more likely to engage with their children compared to fathers who do not have a positive relationship with their child's mother.[18,20]

At each follow-up interview fathers were asked, "How is your relationship with [focal child's] mother?" Possible responses include, "Excellent", "Very good", "Good", "Fair" and "Poor". Father's relationship with child's mother was defined in a binary fashion (Excellent/very good/good, fair/poor) based on the measures of parental relationship quality within the existing literature.

Father Married to Child's Mother

Research suggests that fathers who are married to their child's mother are more likely to be engaged with their children than fathers who are not.[8] At baseline, and during each follow-up survey, mothers were asked, "Are you currently married to [focal child's] father?" Possible responses include, "Yes" and "No". Fathers marital status to child's mother was defined in a binary fashion (Married, Not married) based on the measures of father's marital status within the existing literature.

Father Has Other Children

A limited body of evidence indicates that fathers who have children from a previous relationship may be more likely involved with the child(ren) in from the relationship in which they are currently in relationship.[65] Concerning fathers within the Fragile Families study, this would indicate that fathers with children from previous relationships may be more likely to

engage with the focal child in the study if they are currently in relationship with the focal child's mother.

At baseline, fathers were asked, "Do you have any other children with another woman?" Possible responses include, "Yes" and "No". During each follow-up interview, fathers were asked, "Have you had any other children with another woman since last interview?" Possible answers include, "Yes" and "No". Father having other children was defined in a binary fashion (Yes, No) based on the measures used within the existing literature.

Child's Sex

Research suggests that fathers may be more engaged in the lives of boys compared to girls during early adolescence.[66] Research also suggests that the father-son relationship dynamic differs from the father-daughter relationship dynamic, and that differences in these relationships can translate into differences in child health outcomes.[29]

At baseline, mothers were asked, "What is the sex of your child?" Possible responses include "Boy" or "Girl". Child's sex was defined in a binary fashion (Boy, Girl).

Mother's BMI

Evidence indicates that children whose mothers are overweight are obese experience an increased risk of overweight and obesity.[67,68] Mothers' BMI are based physical measures of height and weight which were assessed during the in-home interviews when the child was three-, five- and nine-years old. Mothers' BMI was calculated by dividing the weight in kilograms by the height in centimeters.[46] This conversion was done by the Fragile Families data team and is available within the dataset.[46] Mothers with BMI measures between 25.0 kg/m2 and 29.9 kg/m2 were considered overweight. Mothers with BMI measures of 30.0 kg/m2 and above were considered obese. This coding criterion is based on the Centers for Disease Control and

Prevention (CDC) definition of overweight and obesity in adults.[69] Mothers' BMI was defined categorically (Normal weight, Overweight, Obese) based on measures within the existing literature.

Mother Engagement

Mother engagement (for that activity) was included as a control in order to produce a more accurate assessment of the effect of father engagement. Specifically, failing to control for mother engagement could create an omitted variable bias, and therefore overestimate the effects of father engagement.[36] Specifically, research suggests that parental engagement from both mothers and fathers improves academic achievement in children.[37] Therefore, father engagement on top of mother engagement yields benefits in child academic achievement above and beyond engagement from fathers alone. Thus, it is important that the additive effects of mother engagement be controlled for. Mother engagement was based on the same binary definition used for father engagement (Engaged, Not engaged). A description of the dependent variables, primary independent variables, covariates and survey years of the Fragile Family study that were used for each study aim is listed in Table 2.

II.b. Analytic Plan

All data were analyzed using the STATA statistical software package version 12.1. Statistical significance was established at $p<0.05$ and marginal statistical significance was established at $p<0.10$. All results for each analysis were reported, regardless of statistical significance.

A priori, univariate analyses were conducted for each of the dependent variables, primary independent variables, and control variables at for each survey year/child age listed in Table 2. The range and central tendency of values for each variable were assessed. Specifically, all

categorical variables were described by frequency distribution and percentage distribution. All continuous variables were described by means and 95 percent confidence intervals.

All missing data were assessed for non-response bias. Specifically, missing data were compared by father age, father race/ethnicity, father education and father residency. T-tests were used to test for differences between missing and available continuous data, and chi-squared tests were used to test for differences between missing and available categorical data. No statistically significant differences between missing and available data were found. Thus, missing data were considered to be missing at random, and were not considered to be missing due to differences in father characteristics. Missing data were dropped from the analysis and no imputation models were used.

II.b.i. Aim 1: Comparing the Patterns of Engagement between Resident and Nonresident Fathers

The sample was restricted to matched pairs of parents who completed the baseline, age 1, age 3, age 5 and age 9 interviews (N = 2,421; 49% of sample). As demonstrated by Table 4, "Response rate for all parents within the Fragile Families study, by age of focal child", mothers have a higher survey response rate compared to fathers at baseline, and at each follow-up interview. The sample size for each survey year for Aim 1 is listed in Table 5.

An illustration of the model specification for Aim 1 can be seen in the appendix in Table A14 and a description of the variables used in the model can be seen in the appendix Table A15.

Bivariate analysis was used to compare demographic characteristics between resident and nonresident fathers. T-tests were used to test for differences between continuous data, and chi-squared tests were used to test for differences between categorical data.

Multivariate analysis was used to assess the association between father residency and father engagement. Specifically, logistic regression was used to assess the association between

father residency and father engagement in the activities listed in Table 2, overall and by race/ethnicity.

Logistic regression models were conducted separately for data at age 1, age 3, age 5 and age 9. Separate regression models where conducted for three reasons. First, as activities in which fathers engaged with their children changed over time (e.g., reading books at age 1 versus helping with homework at age 9), it was important to model father engagement separately at each age. Second, conducting separate regression models allows for comparison between models, which thereby allows for a comparison of father engagement over time. A third reason why separate regression models were used is because the direction of the association may vary by activity. For example, father engagement in the activity of "watching TV" may move in one direction, whereas engagement in the activity of "reading books" may move in a different direction. Thus, aggregating all of the engagement activities together may mask important differences by activity type.

The outputs generated from logistic regression were used to produce predicted probabilities. Predicted probabilities indicate the probability or percent chance of an outcome occurring, and are generally easier to interpret and compare than odds ratios or coefficients.[70] In this analysis, predicted probabilities were generated using the post-estimation margins command in STATA 12.1.[71]

Chi-squared tests were used to assess the statistical significance of differences in the predicted probabilities of engagement between resident and nonresident fathers. Chi-squared tests were also used to examine the statistical significance of differences in predicted probabilities of father engagement by race/ethnicity. Wald tests were used to determine the statistical significance of differences in engagement between survey years.

II.b.ii. Aim 2: Assessing the association between Nonresident Father Engagement and Child Academic Achievement

The sample was restricted to matched pairs of parents who were not living together when the focal child was nine-years-old (N = 1,187; 24% of sample). This analysis was restricted to year 9 of the survey because academic achievement in early adolescence (i.e., ages nine- through thirteen-years) is associated with high school completion,[2,3] which in turn is associated with a number of negative health outcomes including depression, substance abuse, sexually transmitted disease, unplanned pregnancy, and others.[111] Thus, understanding the determinants of early adolescent academic achievement represents a public health priority. As indicated by Table 7, roughly half of fathers within the Fragile Families dataset were nonresident when the focal child was nine-years-old.

Table 7. Father Residency Status at Focal Child Age 9.[a,b]

Father Residency	**N**	**%**
Resident father	1,234	51
Nonresident father	1,187	49
Missing	0	0%

[a]Data are weighted to be representative of births occurring in US cities with populations over 200,000.

[b]"Focal Child" refers to the child that was born unto parents at baseline within the Fragile Families Study

An illustration of the model specification for Aim 2 can be seen in the appendix Table A16 and a description of the variables used in the model can be seen in the appendix in Table A17.

Univariate analyses were conducted for each of the dependent and independent variables and covariates listed in Aim 2 of Table 2, and bivariate analyses were used to compare demographic characteristics between engaged and unengaged fathers.

Multivariate analyses were used to assess the association between father engagement and child academic achievement, overall and by race/ethnicity. Specifically, logistic regression was

used to assess the association between father engagement in at least one of the activities in Table 2, and child having a below-average score on the Woodcock-Johnson III Tests of Achievement (WJ-III) for reading and math achievement, as defined in Table 5.

Logistic regression models were conducted separately for child reading achievement and child math achievement. The outputs generated from logistic regression were used to produce predicted probabilities.

Chi-squared tests were used to assess the statistical significance of differences in the predicted probabilities of academic achievement between children with resident and nonresident fathers, overall and by race/ethnicity.

II.b.iii. Aim 3: Assessing the association between Nonresident Father Engagement and Child Obesity Risk

The sample was restricted to matched pairs of parents who were not living together when the focal child was nine-years-old (N = 1,187; 24% of sample). This analysis was restricted to year 9 of the survey because obesity risk in early adolescence (i.e., ages nine- through thirteen-years) is associated with obesity in adulthood, which in turn is associated with multiple adverse health events, including: coronary heart disease, type 2 diabetes, cancers (endometrial, breast, and colon), hypertension, dyslipidemia (high total cholesterol and high levels of triglycerides), stroke, liver and gallbladder disease, sleep apnea and respiratory problems, osteoarthritis, and gynecological problems (abnormal menses, infertility).[72,73] Moreover, although the association between child obesity risk and adult obesity has been demonstrated in children as young as two-years-old,[74] evidence for the association is most strong among early adolescents, as the physiological and social changes within this stage present a unique exposure to obesity risk.[75,76,77] As summarized in recent publication titled, Adolescent *Obesity and Puberty: the "Perfect Storm"*, authors Jasik and Lustig conclude that, "Weight gain during adolescence carries

a higher risk for adult obesity and the metabolic syndrome. This review highlights early adolescence as a particularly high-risk time for weight gain due to the synergy of naturally occurring metabolic changes along with increasing behavioral risk factors."[88 (p265)]

Univariate analyses were conducted for each of the dependent and independent variables and covariates listed in Aim 3 of Table 2, and bivariate analyses were used to compare demographic characteristics between engaged and unengaged fathers, overall and by race/ethnicity.

An illustration of the model specification for Aim 3 can be seen in the appendix in Table A18 and a description of the variables used in the model can be seen in the appendix Table A19.

Multivariate analysis was used to assess the association between father engagement and child obesity risk, overall and by race/ethnicity. Specifically, logistic regression was used to assess the association between father engagement and child being overweight or obese.[63]

Logistic regression models were conducted separately for child overweight and child obesity. The outputs generated from logistic regression were used to produce predicted probabilities. Chi-squared tests were used to assess the statistical significance of differences in the predicted probabilities of child obesity risk between children with resident and nonresident fathers, overall and by race/ethnicity.

III. CHAPTER THREE: AIM 1

COMPARING THE PATTERNS OF ENGAGEMENT BETWEEN RESIDENT AND NONRESIDENT FATHERS

III.a. Introduction

The role of nonresident fathers in the health and development of children has garnered increasing attention over the past twenty years. Several studies have indicated that father absence is associated with poor child health outcomes,[78,79] and a number of studies have demonstrated that nonresident father engagement is beneficial to child health and development.[80,81] Despite the recent advances in research, several key questions remain. There is absence of research concerning which activities fathers tend to engaged in versus another, as well whether these engagement patterns differ by race/ethnicity. As the prevalence of nonresident fatherhood continues to climb and continues to be concentrated among Black and Hispanic populations,[3,6] this is a critical area of research with profound policy implications.

The Public Health Problem

The prevalence of children who live in households without their father has tripled from 8 percent in 1960 to 24 percent in 2013, and 28 percent of Hispanic children and 51 percent of Black children live in households without their father, compared to 18 percent of White children.[14] Children who live in households without their fathers experience an increased risk of a number of health-related conditions, including behavior problems, poor academic achievement, depression, substance abuse, gang affiliation, criminal behavior and teenage pregnancy.[25-38]

Key Gaps in the Literature

Although evidence indicates that father engagement is associated with improved child health and wellbeing, questions remain concerning the process through which father engagement influences their children. Specifically, there are questions concerning the activities in which

fathers engage with their children, and whether engagement in these activities differs according to father residency status. Moreover, although some research has examined these patterns using the Fragile Families and Child Wellbeing dataset, there is an absence of research which utilizes the most recently available year-9 (age of child) data.

Goals of this Research Aim

Understanding the nature of the activities that fathers engage in with their children, as well as how the levels of engagement in these activities between resident and nonresident fathers differ, are important areas of public health research. First, improved knowledge of nonresident father engagement can help identify ways of maximizing the interactions between nonresident fathers and their children. Moreover, by identifying the gaps in engagement between resident and nonresident fathers, policy measures—such as increased visitation time for noncustodial fathers and/or the promotion of youth mentoring programs (e.g. "Big Brother")—can be undertaken to help fill in the gap.

Hypotheses

The hypotheses of this research are a) resident fathers will have higher levels of engagement in all activities compared to nonresident fathers b) nonresident father engagement will vary according to race/ethnicity, and c) the activities in which fathers engage in will vary according to residency status. The first two hypotheses are based on the evidence that indicates resident fathers are more likely to be engaged with their children compared to nonresident fathers,[13-16] and the research which suggests White have higher levels education and higher incomes compared to Black or Hispanic fathers,[82] while both education and income have been found to be positively associated with father engagement.[19-22] The third hypothesis is based on

the understanding that the varying accessibility to the their children between resident and nonresident fathers may result in differences in activities in which fathers tend to engage.[94]

III.c. Methods

Data

The data for this evaluation come from the Fragile Families and Child Well-being Study (hereafter referred to as "Fragile Families"), a national longitudinal study of 4,898 mostly unmarred parents and their children living in urban environments in the U.S..[83] The sample comes from births which occurred between 1998 and 2000 from twenty U.S. cities, and is representative of all non-marital births in the U.S. to parents residing in cities with populations over 200,000.[43] The study was designed to investigate the conditions and capabilities of low-income unmarried parents, and how children born into these families fare.[43]

The Fragile Families Study is ideal in addressing the aim of this study based on its emphasis on low-income, unmarried fathers.[43] Specifically, nearly one-third of the fathers were nonresident at child's birth, a rate higher than any other similar study to date.[43] This large sample allows for comparisons by residency status. Moreover, the collection of data directly from parents themselves regarding their relationship quality, engagement, and engagement with their children is unique among comparable datasets.[43]

Measure of Father Engagement

Father engagement was measured using items from Home Observation for Measurement of the Environment (HOME) scale in the Fragile Families Study.[84] The HOME Scale is designed to measure the quality and quantity of stimulation and support available to a child in the home environment, and is typically used to assess the effects parental engagement and other in-home influences on child health, behavior and development.[85,86]

Father engagement is based on mother report of frequency father participates in activities with child. Mothers' report was used for four main reasons. Findings from a recent analysis by Hernandez and Coley demonstrate that, "[T]he use of mother reports of father involvement produce composites that show reliability and validity strengths statistically indistinguishable from composites created with fathers' reports of their own involvement."[50 (p28)]

Summary scores for father engagement were generated based on the activities specific to each follow-up survey. The summary scores depict indicate whether fathers engaged in "any" or "at least one" of the said activities with their child at least one day per week. All measures of father engagement are defined in a binary fashion based on father being engaged in said activity/activities with child at least one day per week (Engaged, Not engaged).

Data Analysis

Univariate analyses were conducted for each of the dependent and independent variables of interest within this study and are presented in Table 9.

Bivariate analyses were used to compare demographic characteristics between resident and nonresident fathers. T-tests were used to test for differences between continuous data, and chi-squared tests were used to test for differences between categorical data. The bivariate analyses for the baseline measures are presented in Table 10.

Multivariate analysis was used to assess the association between father residency and father engagement. Logistic regression was also used to identify differences in engagement by race/ethnicity. The outputs generated from logistic regression were used to produce predicted probabilities. Chi-squared tests were used to assess the statistical significance of differences in the predicted probabilities of engagement between resident and nonresident fathers, overall and

by race/ethnicity. Wald tests were used to determine the statistical significance of differences in engagement between survey years.

III.d. Results

Table 8 presents the findings from a univariate analysis of father demographic characteristics at focal child's birth. As indicated by Table 10, fathers were more likely to be resident compared to nonresident (69% to 31%), Black compared to Hispanic or White (47% to 28% to 21%) and less than 30-years of age compared to 30-years of age and above (63% to 37%). Nearly one third of fathers had less than a high school education (32%), roughly one third of fathers had a high school education (35%) and approximately one third of fathers had at least some college education or more (33%). Most fathers were not incarcerated (96%), not married to the focal child's mother (72%) and did not have other children at the time of child's birth (67%). About half of the children were born unto fathers were (52%).

Table 8. Univariate analysis of father demographic characteristics at focal child's birth. (n=3,766)[a,b]

Independent Variables of Interest				
Father Residency	**n**	**%**	**$\bar{x}$**	**95% CI**
Resident father	2,615	69		
Nonresident father	1,151	31		
Missing	0	0%		
Father Race/Ethnicity	**n**	**%**	**$\bar{x}$**	**95% CI**
Black	1,783	47		
Hispanic	1,037	28		
White	776	21		
Other	170	5		
Missing	0	0%		
Control Variables				
Father Age	**n**	**%**	**$\bar{x}$**	**95% CI**
Overall			27.9	27.7 – 28.1
Less than 30 years	2,391	63		
30 years and above	1,375	37		
Missing	0	0%		
Father Education	**n**	**%**	**$\bar{x}$**	**95% CI**
Less than high school	1,212	32		

High school	1,314	35		
Some college or more	1,240	33		
Missing	0	0%		
Father Incarcerated	**n**	**%**	**$\bar{x}$**	**95% CI**
Yes	133	4		
No	3,633	96		
Missing	0	0%		
Father Married to Child's Mother	**n**	**%**	**$\bar{x}$**	**95% CI**
Yes	1,049	28		
No	2,717	72		
Missing	0	0%		
Father has Other Children	**n**	**%**	**$\bar{x}$**	**95% CI**
Yes	1,107	33		
No	2,274	67		
Missing	385	10		
Child's Gender	**n**	**%**	**$\bar{x}$**	**95% CI**
Boy	1,976	52		
Girl	1,790	48		
Missing	0	0%		

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Measures of mother engagement, father engagement and father's relationship with child's mother were not assessed at baseline.

Table 9 presents a bivariate analysis of father demographic characteristics at focal child's birth, comparing resident fathers to nonresident fathers. As the table indicates, Black fathers were more likely to be nonresident compared to resident (71% to 37%), while Hispanic fathers and White fathers were more likely to be resident compared to nonresident (31% to 19% and 27% to 7% respectively). Resident fathers were older compared to nonresident fathers (28.8 years to 25.8 years) and were also more likely to have at least some college education compared to nonresident fathers (38% to 20%). Resident fathers less likely to be incarcerated compared to nonresident fathers, were more likely to be married to their (focal) child's mother compared to nonresident fathers (40% to <1%) and were less likely to have other children with another woman compared to resident fathers (28% to 44%).

Table 9. Bivariate analysis of demographic characteristics at focal child's birth. (n=3,766)[a,b]									
	Resident Fathers (n=2,615)				Nonresident Fathers (n=1,151)				
Independent Variables of Interest									
Father Race/Ethnicity*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Black	969	37			814	71			
Hispanic	814	31			223	19			
White	700	27			76	7			<0.000
Other	132	5			38	3			
missing	0	0%			0	0%			
Control Variables									
Father Age*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Overall			28.8	28.5 – 29.1			25.8	25.4 – 26.2	
Less than 30 years	1,506	58			884	77			
30 years and above	1,109	42			267	23			<0.000
missing	0	0%			0	0%			
Father Education*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Less than high school	771	29			441	38			
High school	839	32			475	41			<0.000
Some college or more	1,005	38			235	20			
missing	0	0%			0	0%			
Father Incarcerated*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Yes	42	2			91	8			
No	2,573	98			1,060	92			<0.000
missing	0	0%			0	0%			
Father Married to Child's Mother*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Yes	1,041	40			8	<1			
No	1,574	60			1,143	99			<0.000
missing	0	0%			0	0%			
Father has Other Children*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Yes	663	28			444	44			
No	1,699	72			575	56			<0.000
missing	253	10%			132	11%			
Child's Gender	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Boy	1,344	51			632	55			
Girl	1,271	49			519	45			0.247
missing	0	0%			0	0%			

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Measures of mother engagement, father engagement and father's relationship with child's mother were not assessed at baseline.

*Statistically significant difference between resident and nonresident in that variable at the p<0.05 level.

Table 10 presents findings from the multivariate analysis of father engagement at focal child age 9. As the table demonstrates, resident fathers were more likely to engage in each activity with focal child compared to nonresident fathers. Resident fathers were also more likely to engage in any category of activities compared to nonresident fathers (98% to 56%).

Table 10. Multivariate analysis of father engagement at focal child age 9, by father residency. (n=2,421)[a,b,c]

	Resident Fathers (n=1,234)		Nonresident Fathers (n=1,187)		
Father Engagement[d]	**pp[e,f](%)**	**95% CI**	**pp[e,f](%)**	**95% CI**	**p-value**
Read books*	53	47 – 59	23	17 – 29	<0.000
Play inside*	41	35 – 47	18	12 – 24	<0.000
Help with chores*	53	47 – 59	20	14 – 26	<0.000
Watch TV*	84	78 – 90	37	31 – 43	<0.000
Talk about day*	93	87 – 99	53	47 – 59	<0.000
Play outside*	69	63 – 75	27	21 – 33	<0.000
Play video games*	44	38 – 50	25	19 – 31	<0.000
Any activity*	98	92 – 100	56	50 – 62	<0.000
missing	12%		23%		

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Data are weighted to be representative of births occurring in US cities with populations over 200,000.

[c]Data are adjusted for father age, father education, father incarceration, father being married to child's mother, father's relationship with child's mother, father having other children and mother engagement.

[d]"How many days per week does child's father usually play inside with toys such as blocks or legos with child?"

[e]Predicted probablity of father engaging in that activity with child at least one day per week.

[f]Predicted probabilities generated from results of logistic regression. Chi-square tests used to assess statistical significance between resident and nonresident fathers.

*Statistically significant difference between resident and nonresident in that activity at the p<0.05 level.

Table 11 presents a multivariate analysis of father engagement father engagement over time. As the table illustrates, resident fathers were more likely to engage in playing inside and reading books with focal child compared to nonresident fathers at each age (i.e., when the focal child was one-, three-, five- and nine-years-old).

At age 9, both resident fathers and nonresident fathers, were less likely to engage in playing inside or reading books compared to each previous year (i.e., when the focal child was one-. three- and five-years-old).

Table 11. Multivariate analysis of father engagement with focal child over time, by father residency.[a,b.c.d]

	Age 1 (n=3,287)	**Age 3** (n=3,165)	**Age 5** (n=2,993)	**Age 9** (n=2,421)
Father Residency	**pp[e,f] (95%CI)**	**pp[e,f] (95%CI)**	**pp[e,f] (95%CI)**	**pp[e,f] (95%CI)**
Play inside				
Overall				
All Fathers	89% (82%-96%)	90% (83%-97%)	85% (78%-92%)	31% (24%-38%)†‡¥
Residency				
Resident	96% (91%-100%)*	97% (92%-100%)*	92% (87%-97%)*	40% (33-47%)*†‡¥
Nonresident	78% (72%-84%)	80% (74%-86%)	77% (71%-83%)	19% (13%-25%)†‡¥
Read books				
Overall				
All Fathers	67% (60%-74%)	79% (72%-86%)	78% (71%-85%)	44% (37%-51%)†‡¥
Residency				
Resident	74% (69%-79%)*	89% (84%-94%)*	88% (83%-93%)*	52% (46%-58%)*†‡¥
Nonresident	56% (50%-62%)	65% (59%-71%)	66% (60%-72%)	25% (19%-31%)†‡¥
Play inside or Read books				
Overall				
All Fathers	92% (85%-99%)	91% (84%-98%)	88% (81%-95%)	46% (39%-53%)†‡¥
Residency				
Resident	98% (93%-100%)*	98% (95%-100%)*	95% (90%-100%)*	66% (60%-772%)*†‡¥
Nonresident	80% (74%-86%)	82% (76%-88%)	79% (73%-85%)	28% (23%-34%)†‡¥

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.
[b]Data are weighted to be representative of births occurring in US cities with populations over 200,000.
[c]Data are adjusted for father age, father education, father race, father incarceration, mother age, mother education, mother race, couple marital status, couple relationship quality, child sex, and father having other children.
[d]Example survey question: "How many days per week does child's father usually play inside with toys such as blocks or legos with child?"
[e]Predicted probablity of father engaging in that activity with child at least one day per week.
[f]Predicted probabilities generated from results of logistic regression. Chi-square tests used to asses statistical significance within ages and adjusted Wald tests used to asses significance between ages.
*Statistically significant difference between resident and nonresident in that age group and in that activity at the p<0.05 level.
†Statistically significant difference from Age 1 in that activity at the p<0.05 level.
‡ Statistically significant difference from Age 3 in that activity at the p<0.05 level.
¥ Statistically significant difference from Age 5 in that activity at the p<0.05 level.

Table 12 presents multivariate analysis of father engagement over time by father race/ethnicity. As the table indicates, at age 1, age 5 and age 9 (i.e., when the focal child was one-, five-, and nine-years-old), Black, Hispanic and White resident fathers were more likely to engage in reading books or playing inside compared to nonresident fathers of the same race/ethnicity. At age 3, Black and White resident fathers (but not Hispanic fathers) were more likely to engage in reading books or playing inside compared to nonresident fathers of the same race/ethnicity.

At age 9, both resident and nonresident Black, White and Hispanic fathers were less likely to engage in playing inside or reading books compared to each previous year (i.e., when the focal child was one-. three- and five-years-old).

Table 12. Multivariate analysis of father engagement in reading books or playing inside with focal child over time, by father residency and father race.[a,b,c,d]

	Age 1		Age 3		Age 5		Age 9	
Father Characteristics	**n**	**pp[e,f] (95%CI)**	**n**	**pp[e]**	**n**	**pp[e]**	**n**	**pp[e]**
Resident								
Black	894	97% (92%-100%)*	768	98% (93%-100%)*	558	95% (90%-100%)*	420	59% (54%-64%)*†‡¥
Hispanic	714	98% (93%-100%)*	610	97% (82%-100%)	499	94% (89%-100%)*	382	68% (63%-73%)*†‡¥
White	615	98% (92%-100)*	551	95% (89%-100%)*	473	95% (90%-100%)*	379	66% (61%-71%)*†‡¥
Nonresident								
Black	635	76% (71%-81%)	766	75% (70%-80%)	910	73% (68%-78%)	767	24% (19%-29%)†‡¥
Hispanic	184	86% (80%-92%)	200	83% (76%-89%)	290	80% (74%-86%)	222	28% (22%-34%)†‡¥
White	101	79% (73%-79%)	135	81% (75%-87%)	144	79% (73%-85%)	162	33% (27%-39%)†‡¥

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Data are weighted to be representative of births occurring in US cities with populations over 200,000.

[c]Data are adjusted for father age, father education, father race, father incarceration, mother age, mother education, mother race, couple marital status, couple relationship quality, child sex, and father having other children.

[d]Father engagement defined by father participating in inside activities or reading books with child at least one day per week.

[e]Predicted probabilities generated from results of logistic regression. Chi-square tests used to asses statistical significance within ages and adjusted Wald tests used to asses significance between ages.

*Statistically significant difference between resident and nonresident in that race category at the p<0.05 level.

†Statistically significant difference from Age 1 in that race category at the p<0.05 level.

‡ Statistically significant difference from Age 3 in that race category at the p<0.05 level.

¥ Statistically significant difference from Age 5 in that race category at the p<0.05 level.

Note: There are no differences within race categories within any age among resident or nonresident fathers. Race category of "other" excluded due to insufficient sample size and power to asses differences.

III.e. Discussion

This study examined patterns of father engagement among resident and nonresident fathers, and investigated whether patterns of engagement differed by residency status and race/ethnicity. The results indicate that resident fathers are more likely to engage in activities with their children compared to nonresident fathers. These results did not find a statistically significant difference in the patterns of father engagement by race/ethnicity.

These results are consistent with previous research showing that nonresident fathers are less involved in the lives of their children compared to resident fathers.[1, 17-22]

These results also suggest that father engagement declines over time among both resident and nonresident fathers, a novel finding within the literature. It is important to note the apparent decline in father engagement over time could reflect father's changing their preference for engagement as their children age. For example at age 9, resident father engagement in the activities of playing inside and reading books are considerably lower than resident father engagement in the activities of watching TV and talking about child's day.

Additionally, it is possible that the engagement activity categories used within the Fragile Families study do not represent the most popular activities in which fathers are likely to engage in with their children over time. Thus, subsequent research may benefit from allowing fathers to identify the activities in which they engage in with their children—older children in particular—as opposed to providing them with a pre-defined catalogue of activities to select from. This study recommends that further research be conducted with two specific aims: 1) to identify whether resident and nonresident father engagement declines over time, and 2) to identify the full range of activities which are representative of father engagement, with an explicit emphasis on identifying the most popular activities at each child-age.

Limitations

There are three main limitations within this study. The first concerns the fact that the data on father engagement is based on mother self-report. Mothers who have a more favorable view of their child's father (e.g., mothers of children with resident fathers) may be inclined to over-report father engagement, while mothers who have a more negative view (e.g., mothers of children with nonresident fathers) may tend to under-report father engagement. This limitation is minimized, however, in light of previous research by Hernandez and Coley indicating that mother report of father engagement represents a valid and reliable proxy of actual father engagement.[50]

A second limitation of this study involves its lack of generalizability to populations of less than 200,000 people. As the majority of Blacks and Hispanics in the U.S. live in urban areas of at least 200,000 people, this limitation is not likely to hinder the interpretation of the results of this study.[87,88]

The third main limitation of this study relates to omitted variable bias. Specifically, unmeasured confounders, such as cultural and community norms towards father engagement, availability of public transportation, and distance between father's residence and child's residence may bias the results.[80-82] Despite not being measured, however, it is important to state these variables are likely to bias the results towards a null or zero effect, and are therefore likely to cause an underestimation of the results as opposed to an overestimation.[89,90]

III.f. Policy Implications

The findings of this study have implications for two specific federal policies from the Administration for Children and Families (ACF). First, the finding that nonresident fathers are far less engaged with their children compared to resident fathers supports Responsible

Fatherhood policy, which seeks to improve nonresident father involvement as a means of improving child health outcomes.[35,36] Second, the find that nonresident father engagement tends to decrease over time supports national child support policy which requires financial contribution from nonresident parents,[37,38] as the benefits of nonresident father engagement may not be available over time.

IV. CHAPTER FOUR: AIM 2

ASSESSING THE ASSOCIATION BETWEEN NONRESIDENT FATHER ENGAGEMENT AND CHILD ACADEMIC ACHIEVEMENT

IV.a. Introduction

Academic achievement−usually defined as years of schooling in adults and test performance in children−is one of the most significant and most consistent determinants of health. Individuals who fail to graduate high school are more likely to suffer from obesity, diabetes, hypertension, HIV, injury, incarceration, lack of health insurance and number of other health consequences, including death.[91, 92,93,94,95] Evidence indicates that over 40 percent of Black and Hispanic students fail to graduate high school compared to 22 percent of White children.[96] One of the most important determinants of high school completion is academic achievement in childhood. Over thirty years of research has consistently demonstrated that academic achievement in early adolescence is predictive of high school graduation.[97,98]

The Public Health Problem

Twenty-eight percent of Hispanic children and fifty-one percent of Black children live in households without their father, compared to eighteen percent of White children.[14] As Black and Hispanic children are at increased risk of having nonresident fathers, while also experiencing an increased risk of poor academic achievement, understanding how nonresident father engagement

impacts academic achievement in early adolescence within these populations is important public health research.

Key Gaps in the Literature

While evidence indicates that father engagement is associated with higher child academic achievement, there is limited research concerning the impact of nonresident father engagement on academic achievement among Black and Hispanic adolescents. Moreover, there is an absence of research regarding which engagement activities may be most important in terms of influencing child academic achievement.

Goals of this Research Aim

The second aim of this thesis focuses on Black and Hispanic *nonresident* fathers, with the goal of determining the association between nonresident father engagement and child academic achievement. Understanding this relationship is a critical public health question as academic achievement in early adolescence is predictive of high school completion−a key socioeconomic determinant of health.[99,100]

Hypothesis

The main hypothesis of this aim is that nonresident father engagement is associated with higher child academic achievement compared to nonresident father absenteeism. This hypothesis is based on the existing literature which indicates that children whose nonresident fathers are engaged with them have higher academic achievement compared to children whose nonresident fathers are not engaged.[4,31-33]

IV.c. Methods

Data

The data for this evaluation come from the Fragile Families and Child Well-being Study (hereafter referred to as "Fragile Families"), a national longitudinal study of nearly 5,000 unmarred parents and their children living in urban areas in the U.S..[101] The sample comes from births which occurred between 1998 and 2000 from twenty U.S. cities, and is representative of all non-marital births in the U.S. to parents residing in cities with populations over 200,000.[43] The study was designed to investigate the conditions and capabilities of low-income unmarried parents, and how children born into these families fare.[43]

The sample used in this current study was restricted to matched pairs of parents who were not living together when the focal child was nine-years-old. Put differently, this sample consists of matched pairs of parents, with mother and focal child living together, and with father living elsewhere/being nonresident when the child was nine-years-old.

Measure of Father Engagement

Father engagement was measured using items from Home Observation for Measurement of the Environment (HOME) scale in the Fragile Families Study.[102] The HOME Scale is one of the most commonly used tools to assess the effects parental engagement and other in-home influences on child health, behavior and development.[103,104] Father engagement is based on mother report of frequency father participates in activities with child.

Measure of Child Academic Achievement

Child academic achievement was assessed using the Woodcock-Johnson III Tests of Achievement (WJ-III), a validated and commonly used measure of scholastic aptitude in early adolescence.[105] The WJ-III measures achievement in reading, math, written language, oral language, and knowledge.[106] Internal consistency reliabilities range between .81 and .94.[57]

Child reading and math achievement were each defined in a binary fashion (Below average vs. Average or above) and by mean test scores, based on the measures of academic achievement used within the existing literature.

Data Analysis

Univariate analyses were conducted for each of the dependent and independent variables of interest within this study. The range and central tendency of values for each variable were assessed. The results from the univariate analyses for this study in Table 13.

Bivariate analyses were used to compare demographic characteristics between engaged versus unengaged nonresident fathers. T-tests were used to test for differences between continuous data, and chi-squared tests were used to test for differences between categorical data. The bivariate analyses for this study are presented in Table 14.

Multivariate analyses were used to assess the association between nonresident father engagement and child academic achievement. Linear regression was used to assess differences in mean test scores, while logistic regression was used to identify differences in the odds of children having a below-average test score. T-tests were used to assess the statistical significance of the differences in mean test scores between children with engaged versus unengaged nonresident fathers. Chi-squared tests were used to assess the statistical significance of differences in the predicted probabilities of academic achievement between children with engaged versus unengaged nonresident fathers.

IV.d. Results

Table 13 presents the findings from univariate analyses of nonresident father demographic characteristics, child academic achievement and nonresident father engagement. As indicated by Table 13, most fathers were Black (64%), at least thirty-years of age (84%),

were not married to the focal child's mother (100%), and had other children (68%). Concerning father engagement, "talking about child's day" was the most common engagement activity, with half (50%) of fathers engaging in this activity at least one day per week, while "playing inside with toys" and "helping child with household chores" were the least common engagement activities, with about two in ten (16%) fathers engaging in this activity at least one day per week.

Table 13 also indicates that the probability of a child having below-average reading achievement and below-average math achievement was 29% and 40% respectively, with mean scores for reading and math being 91.5 and 96.0 respectively.

Table 13. Univariate analysis of father engagement and child academic achievement among nonresident fathers.[a,b] (n=1,187)

Dependent Variables				
Child Academic Achievement	**n**[b]	**%**[c]	$\bar{X}$[d]	**95% CI**
Reading Achievement[e]	446	40	91.5	90.7 – 92.4
Math Achievement[f]	324	29	96.0	95.1 – 97.0
Missing	71	6%		
Independent Variables of Interest				
Father Engagement	**n**[g]	**%**[h]	$\bar{X}$	**95% CI**
Read books	183	20		
Play inside	146	16		
Help with chores	146	16		
Watch TV	302	33		
Talk about day	458	50		
Play outside	220	24		
Play video games	201	22		
Any activity	499	55		
Missing	272	23%		
Father Race/Ethnicity	**n**	**%**	$\bar{X}$	**95% CI**
Black	767	64		
Hispanic	222	19		
White	162	14		
Other	36	3		
Missing	0	0%		
Control Variables				
Father Age	**n**	**%**	$\bar{X}$	**95% CI**
Overall			35.9	35.4 – 36.2

Less than 30 years	193	16		
30 years and above	994	84		
Missing	0	0%		
Father Education	n	%	$\bar{x}$	95% CI
Less than high school	222	19		
High school	419	35		
Some college or more	546	46		
Missing	0	0%		
Father Incarcerated	**n**	**%**	$\bar{x}$	**95% CI**
Yes	47	4		
No	1140	96		
Missing	0	0%		
Father's Relationship with Child's Mother	**n**	**%**	$\bar{x}$	**95% CI**
Excellent, Very good or Good	659	60		
Fair or Poor	439	40		
Missing	89	7%		
Father Married to Child's Mother	**n**	**%**	$\bar{x}$	**95% CI**
Yes	0	0		
No	1187	100		
Missing	0	0		
Father has Other Children	**n**	**%**	$\bar{x}$	**95% CI**
Yes	801	68		
No	377	32		
Missing	9	<1%		
Child's Gender	**n**	**%**	$\bar{x}$	**95% CI**
Boy	596	50		
Girl	591	50		
Missing	0	0		
Mother Engagement	**n**[i]	**%**[j]	$\bar{x}$	**95% CI**
Engaged	1163	99		
Not Engaged	12	<1		
Missing	12	<1%		

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Number of children with a below-average score on that achievement test.

[c]Percent children with a below-average score on that achievement test.

[d]Mean score on that achievement test.

[e]Reading achievement measured by standardized score on Woodcock Johnson III,Test 9 (Average score is 90-110; scores range from 1-136).

[f]Math achievement measured by standardized score on Woodcock Johnson III,Test 10 (Average score is 90-110; scores range from 1-152).

[g]Number of fathers who engaged in that activity with child at least one day per week.

[h]Percent of fathers who engaged in that activity with child at least one day per week.

[i]Number of mothers who engaged in any activity with child at least one day per week.

[j]Percent of mothers who engaged in any activity with child at least one day per week.

Table 14 presents a bivariate analysis of nonresident father demographic characteristics, child academic achievement and nonresident father engagement. As indicated by Table 14, engaged fathers were more likely to be Black, have at least some college education and were more likely to have a positive relationship with the focal child's mother compared to unengaged fathers. Engaged fathers were also less likely to have other children or to be incarcerated compared to unengaged fathers. Table 14 also indicates that there was no statistically significant difference in the probability of a child having below-average reading achievement or below-average math achievement among engaged fathers compared to unengaged fathers, nor was there a difference in mean test scores.

Table 14. Bivariate analysis for father engagement and child academic achievement among nonresident fathers. (n=1,187)[a]

	Engaged Fathers (n=499)				**Unengaged Fathers** (n=688)				
Dependent Variables									
Child Academic Achievement	**n**[b]	**%**[c]	$\bar{X}$[d]	**95% CI**	**N**	**%**	$\bar{X}$	**95% CI**	**p-value**
Reading Achievement[e]	166	35	93.6	91.7 – 95.4	279	43	90.8	89.5 – 92.2	0.152
Math Achievement[f]	119	25	97.6	95.4 – 99.8	205	32	95.6	94.1 – 97.2	0.323
missing	24				47				
Independent Variables of Interest									
Father Race/Ethnicity*	**n**	**%**	$\bar{X}$	**95% CI**	**N**	**%**	$\bar{X}$	**95% CI**	**p-value**
Black	359	72			413	60			
Hispanic	85	17			132	19			
White	45	9			117	17			0.016
Other	10	2			26	4			
missing	0	0%			0	0%			
Control Variables									
Father Age	**n**	**%**	$\bar{X}$	**95% CI**	**N**	**%**	$\bar{X}$	**95% CI**	**p-value**
Overall			36.2	35.3 – 37.2			35.6	35.0 – 36.2	
Less than 30 years	60	12			133	19			0.349
30 years and above	439	88			555	81			
missing	0	0%			0	0%			

Father Education*	**n**	**%**	**$\bar{x}$**	**95% CI**	**N**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Less than high school	65	13			157	23			
High school	180	36			239	35			0.006
Some college or more	254	51			292	42			
missing	0	0%			0	0%			
Father Incarcerated*	**n**	**%**	**$\bar{x}$**	**95% CI**	**N**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Yes	5	1			42	6			<0.000
No	494	99			646	94			
missing	0	0%			0	0%			
Father's Relationship with Child's Mother*	**n**	**%**	**$\bar{x}$**	**95% CI**	**N**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Excellent, Very good or Good	345	73			307	49			<0.000
Fair or Poor	127	27			319	51			
missing	27	5%			62	9%			
Father Married to Child's Mother	**n**	**%**	**$\bar{x}$**	**95% CI**	**N**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Yes	0	0			0	0			0.998
No	499	100			688	100			
missing	0	0%			0	0%			
Father has Other Children*	**n**	**%**	**$\bar{x}$**	**95% CI**	**N**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Yes	308	62			493	72			0.022
No	188	38			189	28			
missing	3	<1%			6	<1%			
Child's Gender	**n**	**%**	**$\bar{x}$**	**95% CI**	**N**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Boy	245	49			351	51			0.588
Girl	254	51			337	49			
missing	0	0%			0	0%			
Mother Engagement	**n[g]**	**%[h]**	**$\bar{x}$**	**95% CI**	**N**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Engaged	490	99			681	99			0.998
Not Engaged	5	1			7	1			
missing	4	<1%			8	1%			

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Number of children with a below-average score on that achievement test.

[c]Percent children with a below-average score on that achievement test.

[d]Mean score on that achievement test.

[e]Reading achievement measured by standardized score on Woodcock Johnson III,Test 9 (Average score is 90-110; scores range from 1-136).

[f]Math achievement measured by standardized score on Woodcock Johnson III,Test 10 (Average score is 90-110; scores range from 1-152).

[g]Number of mothers who engaged in that activity with child at least one day per week.

[h]Percent of mothers who engaged in that activity with child at least one day per week.

*Statistically significant difference between resident and nonresident in that variable at the p<0.05 level.

Table 15 presents a multivariate linear regression analysis of nonresident father engagement and child academic achievement. As Table 15 indicates, children whose fathers engaged in the activity of "reading books" with them had higher mean reading achievement scores compared to children whose fathers did not engage in this activity (93.2 vs. 86.5).

Table 15. Multivariate linear analysis for child having below-average reading or math achievement, by nonresident father engagement.[a,b,c,d]

	N	Reading		Math	
		$\bar{x}$	95% CI	$\bar{x}$	95% CI
Household Chores[g]					
Engaged	147	88.5	84.6 - 92.4	94.9	87.9 - 101.9
Not Engaged	1040	92.4	90.4 - 94.4	95.6	89.4 - 101.8
Play Sports[g]					
Engaged	225	92.0	85.6 - 98.4	95.5	86.5 - 104.6
Not Engaged	962	91.5	89.3 - 93.6	96.9	91.2 - 102.7
Watch TV[g]					
Engaged	296	91.7	86.5 - 96.8	96.0	86.3 - 105.7
Not Engaged	891	91.4	88.4 - 94.3	97.1	91.6 - 102.6
Play Video Games[g]					
Engaged	203	91.4	87.0 - 96.9	93.9	85.1 - 102.7
Not Engaged	984	91.3	89.1 - 93.5	97.1	90.8 - 103.3
Read Books[g]					
Engaged	200	93.2*	91.1 - 95.4	96.7	89.9 - 103.6
Not Engaged	987	86.5	82.6 - 90.4	94.2	88.4 - 100.0
Played Inside[g]					
Engaged	145	90.0	84.7 - 95.2	96.8	89.8 - 103.8
Not Engaged	1042	91.6	89.3 - 94.0	96.6	90.4 - 102.7
Talked about Day[g]					
Engaged	492	92.1	88.3 - 96.0	96.0	88.4 - 103.7
Not Engaged	695	90.5	87.8 - 93.2	97.8	92.1 - 103.4
Talked about Current Events[g]					
Engaged	275	91.8	86.5 - 97.1	97.9	92.2 - 103.5
Not Engaged	912	91.6	89.2 - 93.9	93.2	85.3 - 101.1
Any Engagement[g,h]					
Engaged	509	92.3	88.0 - 96.7	98.1	91.9 - 104.2
Not Engaged	678	91.1	87.9 - 94.2	94.6	86.3 - 102.9

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Data are weighted to be representative of births occurring in US cities with populations over 200,000.

[c]Data are adjusted for father age, father education, father race, father incarceration, mother age, mother education, mother race, couple marital status, couple relationship quality, child sex, and father having other children.

[d]Reading achievement measured by standardized score on Woodcock Johnson III ,Test 9 (Average score is 90-

110; scores range from 70-130).

[e]Math achievement measured by standardized score on Woodcock Johnson III ,Test 10 (Average score is 90-110; scores range from 70-130).

[f]T-tests used to asses statistical significance between engagement groups.

[g]Engaged in activity with child at least one day per week.

[h]Any engagement defined by participation in at least one activity per week with child.

*Statistically significant difference between engaged fathers and not engaged fathers in that activity at the p<0.05 level.

Table 16 presents a multivariate logistic regression analysis of nonresident father engagement and child reading achievement. As Table 16 indicates, children whose fathers engaged in the activity of "reading books" with them had a lower probability of having below-average reading achievement compared to children whose fathers did not engage in this activity (25% to. 39%).

Table 16. Multivariate logistic analysis for child having below-average reading achievement, by nonresident father engagement.[a,b,c,d]

	n	pp[e](%)	95% CI	p-value
Household Chores[f]				
Engaged	147	34	29% - 39%	0.336
Not Engaged	1040	31	28% - 34%	
Play Sports[f]				
Engaged	225	32	27% - 37%	0.318
Not Engaged	962	33	30% - 36%	
Watch TV[f]				
Engaged	296	31	27% - 35%	0.325
Not Engaged	891	28	24% - 32%	
Play Video Games[f]				
Engaged	203	30	20% - 40%	0.226
Not Engaged	984	27	23% - 31%	
Read Books[f]				
Engaged	200	25*	20% - 30%	0.021
Not Engaged	987	39	36% - 42%	
Played Inside[f]				
Engaged	145	33	28% - 38%	0.409
Not Engaged	1042	31	28% - 34%	
Talked about Day[f]				
Engaged	492	29	24% - 34%	0.103
Not Engaged	695	34	31% - 37%	
Talked about Current Events[f]				
Engaged	275	31	26% - 36%	0.412
Not Engaged	912	33	30% - 36%	

Any Engagement[f,g]				
Engaged	509	32	28% - 36%	0.287
Not Engaged	678	35	32% - 38%	

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Data are weighted to be representative of births occurring in US cities with populations over 200,000.

[c]Data are adjusted for father age, father education, father race, father incarceration history, mother age, mother education, mother race, mother engagement for that activity, couple relationship quality and child sex.

[d]Reading achievement measured by standardized score on Woodcock Johnson III ,Test 9 (Average score is 90-110; scores range from 70-130).

[e]Predicted probabilities generated from results of logistic regression. Chi-square tests used to asses statistical significance between engagement groups

[f]Engaged in activity at least one day per week.

[g]Any engagement defined by participation in at least one activity with child.

*Statistically significant difference between engaged fathers and not engaged fathers in that activity at the $p<0.05$ level.

Table 17 presents a multivariate logistic regression analysis of nonresident father engagement and child math achievement. As Table 17 indicates, there are no statistically significant differences in math achievement among children whose nonresident fathers were engaged versus unengaged.

Table 17. Multivariate logistic analysis for child having below-average math achievement, by nonresident father engagement.[a,b,c,d]

	N	pp[e]	95% CI	p-value
Household Chores[f]				
Engaged	147	33	28 - 38	0.382
Not Engaged	1040	34	31 - 37	
Play Sports[f]				
Engaged	225	36	31 - 41	0.092
Not Engaged	962	30	27 - 33	
Watch TV[f]				
Engaged	296	35	30 - 40	0.107
Not Engaged	891	30	27 - 33	
Play Video Games[f]				
Engaged	203	36	31 - 41	0.062
Not Engaged	984	29	26 - 32	
Read Books[f]				
Engaged	200	28	23 - 33	0.285
Not Engaged	987	31	28 - 34	
Play Inside[f]				
Engaged	145	31	26 - 36	0..302
Not Engaged	1042	35	32 - 38	

Talked about Day[f]				
Engaged	492	34	29 - 39	0.445
Not Engaged	695	34	31 - 37	
Talked about Current Events[f]				
Engaged	275	30	25 - 35	0.103
Not Engaged	912	36	33 - 39	
Any Engagement[f,g]				
Engaged	509	33	28 - 38	0.522
Not Engaged	678	34	31 - 37	

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Data are weighted to be representative of births occurring in US cities with populations over 200,000.

[c]Data are adjusted for father age, father education, father race, father incarceration history, mother age, mother education, mother race, mother engagement for that activity, couple relationship quality and child sex.

[d]Math achievement measured by standardized score on Woodcock Johnson III ,Test 10 (Average score is 90-110; scores range from 70-130).

[e]Predicted probabilities generated from results of logistic regression. Chi-square tests used to asses statistical significance between engagement groups.

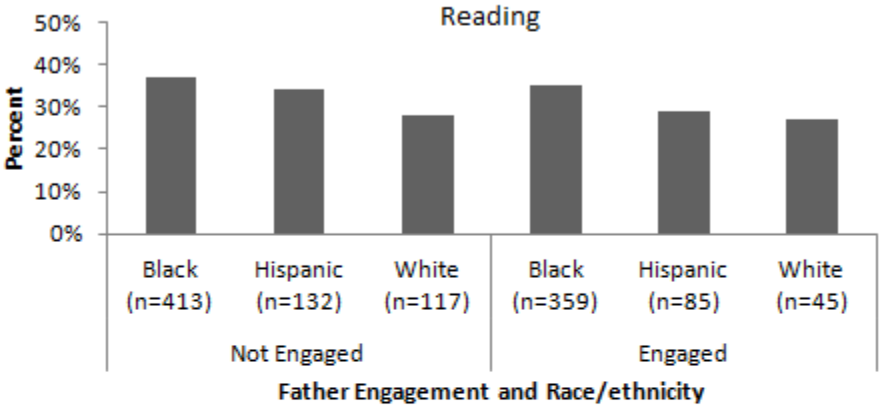
[f]Engaged in activity at least one day per week.

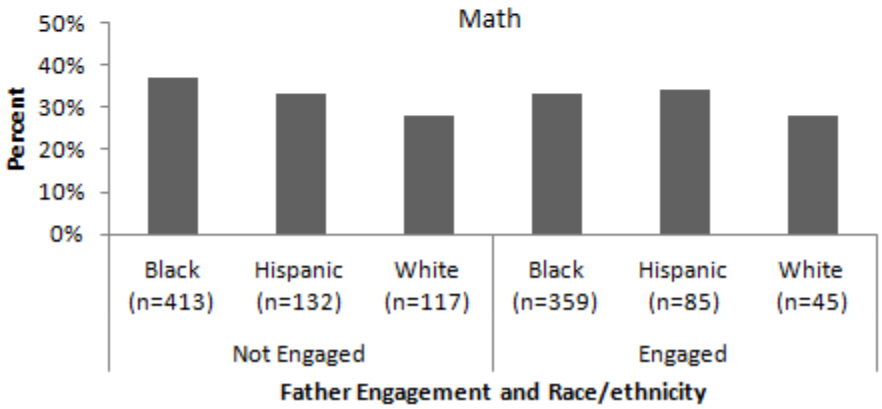
[g]Any engagement defined by participation in at least one activity with child.

*Statistically significant difference between engaged fathers and not engaged fathers in that activity at the $p<0.05$ level.

Figure 7 presents a multivariate logistic regression analysis of nonresident father engagement and child academic achievement by race/ethnicity. As Figure 7 demonstrates, there are no statistically significant differences in child academic achievement among children whose nonresident fathers were engaged versus unengaged by race/ethnicity.

Figure 7. Multivariate logistic analysis for child having below-average reading or math achievement, by nonresident father engagement.[a,b,c,d]





[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Data are weighted to be representative of births occurring in US cities with populations over 200,000.

[c]Data are adjusted for father age, father education, father race, father incarceration history, mother age, mother education, mother race, mother engagement for that activity, couple relationship quality and child sex.

[d]Reading achievement measured by standardized score on Woodcock Johnson III ,Test 9 (Average score is 90-110; scores range from 70-130).

[e]Predicted probabilities generated from results of logistic regression. Chi-square tests used to asses statistical significance between engagement groups

[f]Engaged in activity at least one day per week.

*Statistically significant difference between engaged fathers and not engaged fathers in that race category at the $p<0.05$ level.

III.e. Discussion

This study examined the association between nonresident father engagement and child academic achievement. The results of this study indicate that nonresident father engagement was not statistically associated with child academic achievement in the areas of reading or math. However, nonresident father engagement in the individual activity of reading books was associated with improved child academic achievement. These findings appear to indicate that certain engagement activities may yield a more positive influence on child academic achievement compared to others.

These results are inconsistent with previous findings from Menning C and Thomson et al. who each found that overall nonresident father engagement was associated with higher academic achievement in children.[4, 23] Whereas previous studies found that nonresident father engagement in general was positively associated with child academic achievement, this current study finds a positive association in only one form of engagement.

In light of these findings, this study recommends that further research be conducted with the goal of identifying specific father engagement activities which yield a positive impact on child academic achievement.

III.f. Limitations

A fundamental limitation of this study is the absence of data concerning the relationship between nonresident father engagement and child academic achievement at later child ages. Although this study utilized the most recent data available from the Fragile Families study (i.e., when the focal child was nine-years-old), one should be aware of this limitation when interpreting the results. Specifically, as the assessment represent the relationship between father engagement and child academic achievement only for the first half of the child's life, further

research concerning nonresident father engagement at later child ages is needed in order to provide a more comprehensive interpretation.

A second limitation of this study involves the absence of reliability regarding populations with less than 200,000 people, as the Fragile Families data is not representative of this population. As the majority of Blacks and Hispanics in the U.S.U.S. live in urban areas of at least 200,000 people, this limitation is not likely to hinder the interpretation of the results of this study.[107,108]

The third main limitation of this study relates to omitted variable bias. Specifically, unmeasured confounders, such as whether child received after-school tutoring, whether child attended a public school versus a magnet/charter/private school, or whether child had access to an computer/internet at home could bias the results.[83-85] Although they were not measured here, it is noteworthy to indicate these variables are likely to bias the results towards a null or zero effect on the impact of father engagement and child academic achievement, and are therefore likely to cause an underestimation of the results as opposed to an overestimation.

III.g. Policy Implications

The findings of this study have direct relevance to the No Child Left Behind Act, which requires states to develop academic achievement standards on which schools will be assessed for funding eligibility.[109] Much attention has focused on the failings of inner-city schools, which have a higher proportion of Black and Hispanic students.[110] A better understanding of the impact which nonresident fatherhood may have on poor performance within these schools may result in more appropriate school funding protocols, as well as policies to help mitigate father absenteeism, such as Big Brother and Big Sister programs.

IV. CHAPTER FOUR: AIM 3

ASSESSING THE ASSOCIATION BETWEEN NONRESIDENT FATHER ENGAGEMENT AND CHILD OBESITY RISK

V.a. Introduction

Obesity is the leading cause of preventable death in the U.S. and has more than doubled among adults and has nearly tripled among children over the past thirty years.[111,112,113] Obesity is associated with a number of negative health outcomes, including hypertension,[114] stroke,[115] heart disease,[116] high cholesterol,[117] gallbladder disease,[118] renal disease,[119] cancer,[120] asthma,[121] type 2 diabetes,[122] sleep apnea,[123] and orthopedic complications.[124] Obesity is also associated with mental illness; overweight children, for example, are more likely to suffer from anxiety, depression, and negative self-image than normal-weight children.[125,126] In addition, overweight girls tend to enter puberty at an earlier age, and are therefore forced to cope with the accompanying social stressors prematurely.[127] Collectively, the physical and mental health consequences of obesity can reduce life expectancy by twenty years.[128]

Blacks and Hispanics experience and increased risk of obesity compared to Whites. Nearly 48 percent of Blacks and 42 percent of Hispanic adults are obese, compared to 33 percent of White adults. Further, 20 percent of Black children and 22 percent of Hispanic children are obese, compared to 14 percent of White children. The racial/ethnic disparities in child obesity warrant particular attention because children who are obese are likely to become obese adults.[129]

Twenty-eight percent of Hispanic children and fifty-one percent of Black children live in households without their father, compared to 18 percent of White children.[14] As Black and Hispanic children are at increased risk of having nonresident fathers, while also experiencing an increased risk of obesity, understanding how nonresident father engagement impacts obesity risk in early adolescence within these populations represents critical public health research.

Key Gaps in the Literature

There is limited research concerning the impact that nonresident father engagement has on child obesity risk. The small body of literature on nonresident father engagement and child obesity risk indicates that nonresident father engagement may increase obesity risk in children, but there is an absence of research among Black and Hispanic populations.[34] Additionally, there is an absence of research concerning the relative relationship between specific categories of father engagement and child obesity risk.

Goals of this Research Aim

This aim seeks to identify the relationship between nonresident father engagement and child obesity risk. Specifically, this aim seeks to identify whether children with engaged nonresident fathers have a different level of obesity risk compared to children whose nonresident fathers are unengaged. This aim also seeks to identify whether certain categories of nonresident father engagement have differential effect on child obesity risk compared to others.

Hypothesis

The main hypothesis of this aim is that nonresident father engagement is associated with a lower risk of child obesity compared to nonresident father absenteeism. This hypothesis is based on prior evidence which indicates that father engagement 1) improves child consumption of breakfast and vegetables, and 2) reduces the risk of child food insecurity, both of which have been found to promote a healthy weight in children.[27,28]

V.c. Methods

The data for this evaluation come from the Fragile Families and Child Well-being Study (hereafter referred to as "Fragile Families"), a national longitudinal study of nearly 5,000 unmarred parents and their children living in urban environments in the U.S..[130] The sample

comes from births which occurred between 1998 and 2000 from twenty U.S. cities, and is representative of all non-marital births in the U.S. to parents residing in cities with populations over 200,000.[43] The study was designed to investigate the conditions and capabilities of low-income unmarried parents, and how children born into these families fare.[43]

Measure of Father Engagement

Father engagement was measured using items from Home Observation for Measurement of the Environment (HOME) scale in the Fragile Families Study.[131] The HOME Scale is designed to measure the quality and quantity of stimulation and support available to a child in the home environment, and is typically used to assess the effects parental engagement and other in-home influences on child health, behavior and development.[132,133] The decision to use the HOME scale as measure of father engagement is based on its established validity and reliability in the measure of father engagement; it is commonly used throughout the father engagement literature.[51]

Measure of Child Obesity Risk

Child obesity risk is based on in-home physical measures of height and weight.[134] This is important because physical measures of height and weight are more valid and reliable than self-reported measures,[135,136] and is a major advantage of the Fragile Families Study. Physical measures of height and weight were collected during in-home interviews when children were nine-years-old.[137]

Data Analysis

Univariate analyses were conducted for each of the dependent and independent variables of interest within this study. The range and central tendency of values for each variable were assessed. Specifically, all categorical variables were described by frequency distribution and

percent distribution, while continuous variables were described by means and 95 percent confidence intervals.

Bivariate analyses were used to compare demographic characteristics between resident and nonresident fathers. T-tests were used to test for differences between continuous data, and chi-squared tests were used to test for differences between categorical data.

Multivariate analyses were used to assess the association between nonresident father engagement and child obesity risk. Specifically, linear regression and logistic regression were used to assess the association between nonresident father engagement child being overweight or obese. In addition, logistic regression was used to identify differences in the relationship between nonresident father engagement and child obesity risk by father's race and ethnicity. Chi-squared tests were used to assess the impact of early father engagement (i.e., when the focal child was one-, three-, and five-years-old), on obesity risk at age-nine.

V.d. Results

Table 18 presents the findings from univariate analyses of nonresident father demographic characteristics, child obesity risk and nonresident father engagement. As indicated by Table 18, most fathers were Black (64%), at least thirty-years of age (84%), were not married to the focal child's mother (100%), and had other children (68%). Concerning father engagement, "talking about child's day" was the most common engagement activity, with half (50%) of fathers engaging in this activity at least one day per week, while "playing inside with toys" and "helping child with household chores" were the least common engagement activities, with about two in ten (16%) fathers engaging in this activity at least one day per week.

Table 18 also indicates that the probability of a child being overweight or obese was 41% and 28% respectively.

Table 18. Univariate analysis for nonresident father engagement and child obesity risk. (n=1,187)[a]				
Dependent Variables				
Child Obesity Risk	**n[b]**	**%[c]**	**$\bar{x}$**	**95% CI**
Overweight[d]	487	41		
Obese[e]	332	28		
Missing	0	0%		
Independent Variables of Interest				
Father Engagement	**n[f]**	**[g]**	**$\bar{x}$**	**95% CI**
Read books	183	20		
Play inside	146	16		
Help with chores	146	16		
Watch TV	302	33		
Talk about day	458	50		
Play outside	220	24		
Play video games	201	22		
Any activity	499	55		
Missing	272	23%		
Father Race/Ethnicity	**n**		**$\bar{x}$**	**95% CI**
Black	767	64		
Hispanic	222	19		
White	162	14		
Other	36	3		
Missing	0	0%		
Control Variables				
Father Age	**n**	**%**	**$\bar{x}$**	**95% CI**
Overall			35.9	35.4 – 36.2
Less than 30 years	193	16		
30 years and above	994	84		
Missing	0	0%		
Father Education	**n**	**%**	**$\bar{x}$**	**95% CI**
Less than high school	222	19		
High school	419	35		
Some college or more	546	46		
Missing	0	0%		
Father Incarcerated	**n**	**%**	**$\bar{x}$**	**95% CI**
Yes	47	4		
No	1140	96		
Missing	0	0%		
Father's Relationship with Child's Mother	**n**	**%**	**$\bar{x}$**	**95% CI**
Excellent, Very good or Good	659	60%		
Fair or Poor	439	40%		

Missing	89	7%		
Father Married to Child's Mother	**n**	**%**	**$\bar{x}$**	**95% CI**
Yes	0	0		
No	1187	100		
Missing	0	0%		
Father has Other Children	**n**	**%**	**$\bar{x}$**	**95% CI**
Yes	801	68		
No	377	32		
Missing	9	0%		
Child's Gender	**n**	**%**	**$\bar{x}$**	**95% CI**
Boy	596	50		
Girl	591	50		
Missing	0	0%		
Maternal Obesity Risk	**n**	**%**	**$\bar{x}$**	**95% CI**
Overweight	938	79		
Obese	641	54		
Missing	0	0%		
Mother Engagement	**n[h]**	**%[i]**	**$\bar{x}$**	**95% CI**
Engaged	1163	99		
Not Engaged	12	<1		
Missing	12	<1%		

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Number of children who are overweight or obese.

[c]Percent children who are overweight or obese.

[d]Child overweight defined as a BMI at or above the 85th percentile and lower than the 95th percentile for children of the same age and sex on the CDC BMI-for-age growth charts.

[e]Child obesity defined as a BMI at or above the 95th percentile for children of the same age and sex on the CDC BMI-for-age growth charts.

[f]Number of fathers who engaged in that activity with child at least one day per week.

[g]Percent of fathers who engaged in that activity with child at least one day per week.

[h]Number of mothers who engaged in any activity with child at least one day per week.

[j]Percent of mothers who engaged in any activity with child at least one day per week.

Table 19 presents a bivariate analysis of nonresident father demographic characteristics, child academic achievement and nonresident father engagement. As indicated by Table 19, engaged fathers were more likely to be Black, have at least some college education and were more likely to have a positive relationship with the focal child's mother compared to unengaged fathers. Engaged fathers were also less likely to have other children or to be incarcerated compared to unengaged fathers. Table 19 also indicates that there was no statistically significant

difference in the probability of a child being overweight or obese among engaged fathers compared to unengaged fathers, nor was there a difference in mean test scores.

Table 19. Bivariate analysis nonresident father engagement and child obesity risk. (n=1,187)[a]									
	Engaged Fathers (n=499)				Unengaged Fathers (n=688)				
Dependent Variables									
Child Obesity Risk	**n[b]**	**%[c]**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Overweight[d]	234	47			253	37			
Obese[e]	163	33			169	25			0.180
missing	0	0%			0	0%			
Independent Variables of Interest									
Father Race/Ethnicity	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Black	359	72			413	60			
Hispanic	85	17			132	19			
White	45	9			117	17			0.016
Other	10	2			26	4			
missing	0	0%			0	0%			
Control Variables									
Father Age	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Overall			36.2	35.3 – 37.2			35.6	35.0 – 36.2	
Less than 30 years	60	12			133	19			0.349
30 years and above	439	88			555	81			
missing	0	0%			0	0%			
Father Education	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Less than high school	65	13			157	23			
High school	180	36			239	35			
Some college or more	254	51			292	42			0.006
missing	0	0%			0	0%			
Father Incarcerated	n	%	x̄	95% CI	n	%	x̄	95% CI	p-value
Yes	5	1			42	6			
No	494	99			646	94			<0.000
missing	0	0%			0	0%			
Father's Relationship with Child's Mother	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Excellent, Very good or Good	345	73			307	49			<0.000
Fair or Poor	127	27			319	51			
missing	27	5%			62	9%			

Father Married to Child's Mother	**n**	**%**	**$\bar{x}$**	**95% CI**	**n**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Yes	0	0			0	0			
No	499	100			688	100			0.998
missing	0	0%			0	0%			
Father has Other Children	**n**	**%**	**$\bar{x}$**	**95% CI**	**n**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Yes	308	62			493	72			0.022
No	188	38			189	28			
missing	3	<1%			6	<1%			
Child's Gender	**n**	**%**	**$\bar{x}$**	**95% CI**	**n**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Boy	245	49			351	51			
Girl	254	51			337	49			0.588
missing	0	0%			0	0%			
Maternal Obesity Risk	**n**	**%**	**$\bar{x}$**	**95% CI**	**n**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Overweight	384	77			550	80%			0.239
Obese	289	58			352	51%			0.188
missing	0	0%			0	0%			
Mother Engagement	**n[f]**	**%[g]**	**$\bar{x}$**	**95% CI**	**n**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Engaged	490	99%			681	99%			
Not Engaged	5	1			7	1			0.998
missing	4	<1%			8	1%			

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Number of children who are overweight or obese.

[c]Percent children who are overweight or obese.

[d]Child overweight defined as a BMI at or above the 85th percentile and lower than the 95th percentile for children of the same age and sex on the CDC BMI-for-age growth charts.

[e]Child obesity defined as a BMI at or above the 95th percentile for children of the same age and sex on the CDC BMI-for-age growth charts.

[f]Number of mothers who engaged in that activity with child at least one day per week.

[g]Percent of mothers who engaged in that activity with child at least one day per week.

Table 20 presents a multivariate logistic regression analysis of nonresident father engagement and child obesity risk. As Table 20 indicates, children whose fathers engaged in the activity of "watching TV" with them had a higher risk of overweight and obesity compared to children whose fathers did not engage in this activity (overweight: 53% to 35%; obesity: 38% to 22%). Additionally, children whose fathers engaged in the activity of "playing video games" with them had a higher risk of overweight and obesity compared to children whose fathers did not engage in this activity (overweight: 52% to 36%; obesity: 37% to 24%).

Table 20. Multivariate linear and logistic analysis nonresident father engagement and child obesity risk.[a,b,c]							
		BMI		Overweight[d]		Obese[e]	
	n	$\bar{x}$	95% CI	pp[f](%)	95% CI	pp[f](%)	95% CI
Household Chores[g]							
Engaged	147	18.7	17.2 - 20.3	49	42 - 56	31	25 - 37
Not Engaged	1040	18.9	17.9 - 20.0	37	30 - 44	20	14 - 26
Play Sports[g]							
Engaged	225	18.7	17.2 - 20.2	47	40 - 54	31	26 - 36
Not Engaged	962	19.1	18.1 - 20.1	40	33 - 47	24	18 - 30
Watch TV[g]							
Engaged	296	20.2	18.7 - 21.6	53*	46 - 60	38*	32 - 44
Not Engaged	891	18.5	17.5 - 19.6	35	28 - 42	22	16 - 28
Play Video Games[g]							
Engaged	203	20.0	18.5 - 21.5	52*	45 - 59	37*	31 - 43
Not Engaged	984	18.4	17.4 - 19.4	36	29 - 43	24	19 - 29
Read Books[g]							
Engaged	200	19.0	17.5 - 20.5	50	43 - 57	32	25 - 39
Not Engaged	987	18.7	17.7 -19.7	39	32 - 46	19	12 - 26
Play Inside[g]							
Engaged	145	19.9	18.5 - 21.3	50	43 - 58	33	27 - 40
Not Engaged	1042	18.7	17.7 - 19.8	38	31 - 45	20	13 - 27
Talked about Day[g]							
Engaged	492	19.1	17.7 - 20.5	48	41 - 55	31	25 - 37
Not Engaged	695	18.8	17.6 - 20.0	37	30 - 44	20	14 - 26
Talked about Current Events[g]							
Engaged	275	19.1	18.0 - 20.2	48	42 - 54	32	25 - 39
Not Engaged	912	18.9	18.0 - 19.9	36	29 - 43	22	16 - 28
Any Engagement[g,h]							
Engaged	509	18.9	17.4 - 20.3	48	41 - 56	31	25 - 37
Not Engaged	678	18.8	17.5 - 20.1	37	30 - 44	20	16 - 26

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Data are weighted to be representative of births occurring in US cities with populations over 200,000.

[c]Data are adjusted for father age, father education, father race, father incarceration history, mother age, mother education, mother race, mother BMI, mother engagement for that activity, couple relationship quality and child sex.

[d]Child overweight defined as a BMI at or above the 85th percentile and lower than the 95th percentile for children of the same age and sex on the CDC BMI-for-age growth charts.

[e]Child obesity defined as a BMI at or above the 95th percentile for children of the same age and sex on the CDC BMI-for-age growth charts.

[f]Predicted probabilities generated from results of logistic regression. Chi-square tests used to assess statistical significance between engagement groups.

[g]Engaged in activity at least one day per week.

[h]Any engagement defined by participation in at least one activity with child.

*There are no statistically significant differences between engaged fathers and not engaged fathers in any activity at the $p<0.05$ level.

Table 21 presents a multivariate analysis of nonresident father engagement at ages one-, three- and five-years-old a child obesity risk at age nine-years-old. As Table 21 indicates, there is statistically significant difference in child obesity risk among fathers who were engaged versus absent at earlier child ages.

Table 21. Multivariate analysis of child being overweight or obese over time, by nonresident father engagement.[a,b.c.d]

Father Characteristics	n	Age 1 pp[e] (95% CI)	n	Age 3 pp[e] (95% CI)	n	Age 5 pp[e] (95% CI)
Engaged[f]		47% (44%-50%)		50% (47%-53%)		51% (48%-54%)
Black		49% (46%-52%)		52% (49%-55%)†		51% (48%-55%)†
Hispanic		50% (47%-53%)‡		51% (48%-53%)		53% (50%-56%)‡
White		42% (38%-46%)		44% (40%-48%)		40% (36%-44%)
Not Engaged		38% (35%-41%)		40% (37%-43%)		41% (37%-45%)
Black		38% (35%-42%)		41% (38%-44%)		41% (38%-44%)
Hispanic		39% (36%-43%)		40% (37%-43%)		42% (38%-46%)
White		35% (32%-38%)		36% (32%-40%)		35% (30%-40%)

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Data are weighted to be representative of births occurring in US cities with populations over 200,000.

[c]Data are adjusted for father age, father education, father race, father incarceration history, mother age, mother education, mother race, mother BMI, mother engagement for that activity, couple relationship quality and child sex.

[d]Child being overweight or obese defined as child having a BMI at or above the 85th percentile for children of the same age and sex on the CDC BMI-for-age growth charts.

[e]Predicted probabilities generated from results of logistic regression. Chi-square tests used to asses statistical significance between engagement groups and between race/ethnicity categories. Adjusted Wald tests used to asses significance between ages categories.

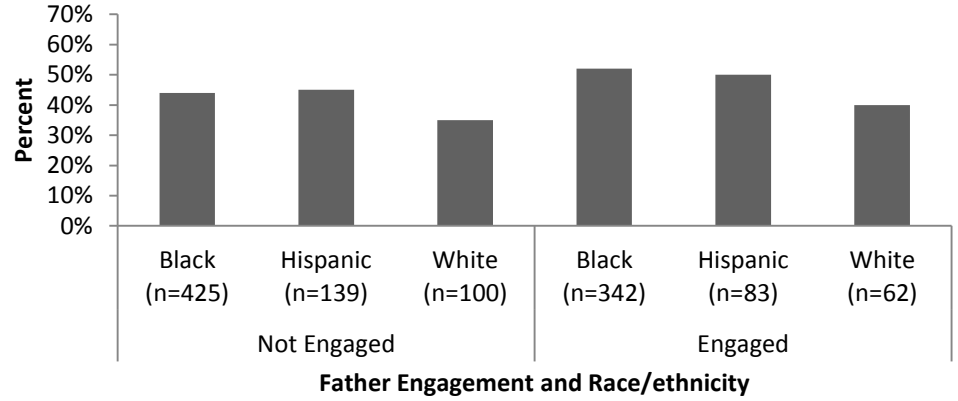
[f] Engagement defined by participation in reading books or playing inside, at least one day per week with child.

†Statistically significant difference between Black and White in that engagement category and age group at the $p<0.05$ level.

‡ Statistically significant difference between Hispanic and White in that engagement category and age group at the $p<0.05$ level.

Figure 9 presents the probability of child overweight and obesity by nonresident father engagement and race/ethnicity. As figure 9 demonstrates, there are no statistically significant differences in child overweight or obesity risk by race/ethnicity.

Figure 8. Probability of child being overweight or obese, by father engagement and race/ethnicity among nonresident fathers.[a,b,c,d]



[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Data are weighted to be representative of births occurring in US cities with populations over 200,000.

[c]Data are adjusted for father age, father education, father race, father incarceration history, mother age, mother education, mother race, mother BMI, mother engagement for that activity, couple relationship quality and child sex.

[d]Child obesity defined as a BMI at or above the 95th percentile for children of the same age and sex on the CDC BMI-for-age growth charts.

[e]Predicted probabilities generated from results of logistic regression. Chi-square tests used to asses statistical significance between engagement groups

[f]Engagement defined by participation in reading books or playing inside, at least one day per week with child.

*There are no statistically significant differences between engaged fathers and not engaged fathers by race in any activity at the $p<0.05$ level.

V.e. Discussion

This study examined the association between nonresident father engagement and child obesity risk. The results of this study indicate that nonresident father engagement was not statistically associated with child overweight or obesity risk. However, nonresident father engagement in the individual activity of watching TV and playing video games were each associated with overweight and obesity. These findings appear to indicate that certain sedentary engagement activities have a more damaging effect on child overweight and obesity compared to others.

These results are consistent with previous research from Menning and Stewart, which found that nonresident father engagement was associated with an increased risk of child obesity.[23] Whereas this study found that nonresident father engagement overall was positively associated with child obesity risk, this current study finds a positive association in only two forms of engagement: watching TV and playing video games.

In light of these findings, this study recommends that additional research be conducted with the goals of identifying specific father engagement activities which tend to increase and decrease the risk of child overweight and obesity. In addition, the findings of this study also suggest that fatherhood programs, parenting classes and other initiatives which promote father involvement consider both the benefits and limitations of specific forms of father-child engagement.

Limitations

A primary limitation of this study lies in the absence of available data concerning the relationship between nonresident father engagement and child obesity risk at later child ages. Although this study utilized the most recent data available from the Fragile Families study (i.e., when the focal child was nine-years-old), caution should be exercised in summarizing the results the results. To clarify, as this assessment represent the relationship between father engagement and child academic achievement for the first half of the child's life only, further research concerning the impact of nonresident father engagement at later child ages is needed in order to provide a more complete understanding.

A second limitation of this study involves is lack of representativeness of populations of less than 200,000 people, as the Fragile Families data set was not designed to be extrapolated to these populations. As the majority of Blacks and Hispanics in the U.S. live in cities of at least

200,000 people, this limitation is not likely to hinder the interpretation of the results of this study.[138,139]

The third main limitation of this study relates to omitted variable bias. In particular, data on father's BMI was not available, as father's BMI was not accessed within the Fragile Families study. As evidence indicates that father's obesity risk is associated with child obesity risk, this is a considerable omission.[140] Other unmeasured confounders may bias the results include the availability of full-service grocery stores within the community, the concentration of fast food venues and child's participation in youth sports programs.[88-91] Despite not being measured, however, it is important to state these variables are likely to bias the results towards a null or zero effect, and are therefore likely to cause an underestimation of the results as opposed to an overestimation.

Policy Implications

The results of this study have considerable implications concerning child custody and non-custodial parental visitation policy. Currently, there is an absence of guidance concerning the nature of activities in which non-custodial parents (i.e., nonresident fathers) engage in with their children during scheduled visits.[141] The results of this study indicate a need for policies which promote positive forms of engagement between non-custodial parents and their children. A policy that pairs parenting classes with court-order child custody arrangements is an example of a policy initiative which may promote more positive forms of engagement among nonresident fathers. As the majority of Black and Hispanic children are born unto unmarried parents (placing them at increased risk of noncustodial visitation),[10] coupled with the disparate concentration of overweight and obesity among Black and Hispanic children,[6] policies which encourage

nonresident father engagement to promote a healthy child weight may have help reduce racial/ethnic disparities in child obesity risk.

VI. CHAPTER SIX: DISCUSSION

VI.a. Summary of Findings

Aim 1

Study Aim 1 examined patterns of father engagement among resident and nonresident fathers, and investigated whether patterns of engagement differed by residency status and race/ethnicity. The results indicate that resident fathers are more likely to engage in activities with their children compared to nonresident fathers. These results did not find a statistically significant difference in the patterns of father engagement by race/ethnicity.

These results also suggest that father engagement declines over time among both resident and nonresident fathers, a novel finding within the literature. It is important to note the apparent decline in father engagement over time could reflect father's changing their preference for engagement as their children age. For example at age 9, resident father engagement in the activities of playing inside and reading books are considerably lower than resident father engagement in the activities of watching TV and talking about child's day.

Additionally, it is possible that the engagement activity categories used within the Fragile Families study do not represent the most popular activities in which fathers are likely to engage in with their children over time. Thus, subsequent research may benefit from allowing fathers to identify the activities in which they engage in with their children—older children in particular—as opposed to providing them with a pre-defined catalogue of activities to select from. This study recommends that further research be conducted with two specific aims: 1) to identify whether resident and nonresident father engagement declines over time, and 2) to identify the

full range of activities which are representative of father engagement, with an explicit emphasis on identifying the most popular activities at each child-age.

Aim 2

Study Aim 2 examined the association between nonresident father engagement and child academic achievement. The results of this study indicate that nonresident father engagement was not statistically associated with child academic achievement in the areas of reading or math. However, nonresident father engagement in the individual activity of reading books was associated with improved child academic achievement. These findings appear to indicate that certain engagement activities may yield a more positive influence on child academic achievement compared to others. Whereas previous studies found that nonresident father engagement in general was positively associated with child academic achievement, this current study finds a positive association in only one form of engagement.

In light of these findings, this study recommends that further research be conducted with the goal of identifying specific father engagement activities which yield a positive impact on child academic achievement.

Aim 3

Study Aim 3 examined the association between nonresident father engagement and child obesity risk. The results of this study indicate that nonresident father engagement was not statistically associated with child overweight or obesity risk. However, nonresident father engagement in the individual activity of watching TV and playing video games were each associated with overweight and obesity. These findings appear to indicate that certain sedentary engagement activities have a more damaging effect on child overweight and obesity compared to others. Whereas this study found that nonresident father engagement overall was positively

associated with child obesity risk, this current study finds a positive association in only two forms of engagement: watching TV and playing video games.

VI.b. Limitations and Strengths

Several limitations are present within this thesis. A first limitation involves the fact that the data on father engagement is based on mother self-report. Mothers who have a more favorable view of their child's father (e.g., mothers of children with resident fathers) may be inclined to over-report father engagement, while mothers who have a more negative view (e.g., mothers of children with nonresident fathers) may tend to under-report father engagement. This limitation is minimized, however, in light of previous research by Hernandez and Coley indicates that mother report of father engagement represents a valid and reliable proxy of actual father engagement.[50]

Another limitation of this thesis involves is lack of representativeness of populations of less than 200,000 people, as the Fragile Families data set was not designed to be generalized to these populations. As the majority of Blacks and Hispanics in the U.S. live in cities of at least 200,000 people, this limitation is not likely to hinder the interpretation of the results of this study.[142,143]

A third limitation within this thesis is the absence of available data concerning the relationship between nonresident father engagement and child academic achievement child obesity risk at later child ages. Although this study utilized the most recent data available from the Fragile Families study (i.e., when the focal child was nine-years-old), caution should be exercised in summarizing the results the results. To clarify, as this thesis represents the relationship between father engagement and child health and wellbeing for the first half of the

child's life only, further research concerning the impact of nonresident father engagement at later child ages is needed in order to provide a more detailed picture of the relationship.

An additional limitation of this thesis involves omitted variable bias. Specifically, unmeasured confounders have the potential to bias the results. For Aim 1, compares engagement between resident and nonresident fathers, such variables include cultural and community norms towards father engagement, availability of public transportation, and distance between father's residence and child's residence may bias the results. For Aim 2, which measures the association between nonresident father engagement and child academic achievement, important unmeasured confounders include whether the child received after-school tutoring, whether child attended a public school versus a magnet/charter/private school, or whether child had access to a computer/internet at home. For study Aim 3, which measures the association between nonresident father engagement and child obesity risk, omitted variables include father's BMI, the availability of full-service grocery stores within the community, the concentration of fast food venues and child's participation in youth sports programs.

A fifth limitation of this thesis concerns the absence of data on father's BMI, as father's BMI was not accessed within the Fragile Families study. Measures of height and weight (used to calculate BMI) were assessed during in-home interviews with the focal child and the focal child's primary care provider. As mothers were the primary care providers for the focal child in the vast majority of instances, fathers were excluded from measures of height and weight. Research indicates that paternal obesity influences child obesity risk, so the omission of height and weight data on fathers represents an important limitation.[144] However, the inclusion of in-home measures of height and weight measures for mothers helps to minimize this limitation, as

research indicates that maternal obesity risk may yield a more influential impact on child obesity risk compared to fathers.[66,67]

A final limitation of thesis concerns the possible interrelationship between child obesity risk and child academic achievement. Specifically, in addition to being outcomes of interest within this thesis, child academic achievement and child obesity risk may influence each other, which may, potentially, introduce a bias into the results. For example, Aim 2 assesses the relationship between nonresident father engagement and child academic achievement, while Aim 3 examines the relationship between nonresident father engagement and child obesity risk. Evidence indicates that children who are obese may experience an increased risk of bullying and may miss more days of school compared to normal weight children, both of which may subject to them to poorer academic achievement.[144,145] Thus, in this thesis, it is possible that the outcome of interest in Aim 2 (child academic achievement) may be partially influenced by the outcome of interest in Aim 3 (child obesity risk). Controlling for the effect which each of these influences may have for each other within the statistical analyses of this thesis minimize any methodological influence or misinterpretation of the results. In sum, child academic achievement and child obesity risk represent two of the most important public health challenges facing children in the U.S., and identifying their social determinants—whether conducted separately or collectively—represent important and necessary contributions to the public health literature.

Although there are several limitations present within this study, there are also a number of important strengths that are worthy of consideration. First, nearly one third (31 %) of the fathers within the Fragile Families were nonresident at their child's birth, a rate higher than any

other similar study.[43] Such a high proportion of nonresident fathers allows for a more reliable comparison between resident and nonresident fathers.

Additionally, the collection of data directly from parents themselves on measures concerning their education, relationship quality, and engagement with their children is unique among comparable studies, which often rely on data from relatives and other proxies.[43]

The use of in-home measures of height and weight to assess obesity risk is a major strength of this study, and represents a considerable advantage over studies which rely on self-report of height and weight.

Finally, as a longitudinal assessment, the Fragile Families study allows for comparisons of father engagement between resident and nonresident fathers over time, which is a major advantage over cross-sectional assessments.

VI.c. Policy Implications

The specific policy implications for each individual research aim presented below, followed by a description of the overall policy implications of this thesis.

The findings of Aim 1 have implications for federal Responsible Fatherhood policy, which is governed by the Administration for Children and Families (ACF). In particular, the findings that nonresident fathers are far less engaged with their children compared to resident fathers−and that this gap in father engagement widens over time−supports two of the central aims of Responsible Fatherhood policy, which are to promote healthy marriage and encourage responsible parenting.[35,36] Specific examples of measures which are currently used to promote healthy marriage include a) disseminating information about the benefits of marriage and two-parent involvement for children, b) marriage preparation programs and premarital counseling, and c) divorce education and reduction programs, including mediation and counseling. Parenting

skills training and mentoring are the primary actions which are currently used to promote responsible parenting.

The results from study Aim 2 have direct relevance to the No Child Left Behind Act, which requires states to develop academic achievement standards on which schools will be assessed for funding eligibility.[112] Much attention has focused on the failings of inner-city schools, which have a higher proportion of Black and Hispanic students.[113] A better understanding of the impact which nonresident fatherhood may have on poor performance within these schools may result in more appropriate school funding protocols, as well as policies to help mitigate father absenteeism, such as youth mentoring programs (e.g., Big Brother and Big Sister programs), after-school programs (e.g., Girls and Boys Clubs, YMCA) and youth sports programs.

The findings from Aim 3 have considerable implications concerning child custody and non-custodial parental visitation policy. Currently, there is an absence of guidance concerning the nature of activities in which non-custodial parents (i.e., nonresident fathers) engage in with their children during scheduled visits.[146] The results of this study indicate a need for policies which govern the nature of activities in which non-custodial parents engage in with their children. As the majority of Black and Hispanic children are born unto unmarried parents (placing them at increased risk of noncustodial visitation),[10] coupled with the disparate concentration of overweight and obesity among Black and Hispanic children,[6] policies which encourage nonresident father engagement to promote a healthy child weight may have help reduce racial/ethnic disparities in child obesity risk.

Overall, the policy implications from this thesis are fall into three main categories: 1) policies to reduce the prevalence of nonresident fatherhood, 2) polices to promote effective

engagement among existing nonresident fathers, and 3) policies to mitigate the effects of nonresident father absence.

As described previously, Responsible Fatherhood policy−and the associated programs to encourage healthy marriages and relationships while reducing divorce−is the primary policy tool that is used to reduce the prevalence of nonresident fatherhood.[37] However, current program provisions may be inadequate to make a substantial impact nationwide. There are currently 55 Responsible Fatherhood programs throughout the U.S., operating within a $75 million shared annual budget.[37] This equates to about one program per state, with roughly $1.4 million dollars in annual funding per program. To put this into perspective, there are approximately 10.4 million households in the U.S., headed by mothers, where at least one of the child's fathers is absent.[147] In other words, there is a budget of less than 14 cents per father-absent household, and approximate one Responsible Fatherhood program per 190,000 father-absent households in the U.S..[37,153] The goal of reducing the prevalence of nonresident fatherhood may be difficult to achieve if the financing and promotion of Responsible Fatherhood policy does not align with the magnitude of father-absent households.

Responsible Father policies is the main approach that is currently used to promote effective father engagement among nonresident fathers in the U.S.. The previously indicated statistics concerning the inadequacy of Responsible Fatherhood programs to effectively reduce the prevalence of nonresident fatherhood also apply to the goal of promoting engagement among nonresident fathers. Similar to the objective of reducing the prevalence of nonresident fatherhood, it may prove to be challenging to encourage paternal engagement among nonresident fathers on a national scale without adequate financial and operational provisions.

As described previously in this thesis, the primary policy response to mitigate the effects of nonresident father absence has come through child support enforcement, which requires noncustodial parents to make regular financial contributions to custodial parents. Also described throughout this thesis is its exclusive focus on the social engagement of nonresident fathers, as opposed to other forms of involvement (e.g., provision of money, food, clothes, etc.), thus, a discussion concerning the policy implications of child support policy rests outside the scope of this present research.

VI.c. Next Steps for Research and Policy

The findings of this thesis represent an important contribution to the public health literature concerning the social engagement patterns of nonresident fathers and the health and wellbeing of their children. Despite the contributions of this thesis, however, several questions remain. This section outlines specific actions which researchers can take in order to further our understanding of the causes and consequences of nonresident father engagement and father absence, as well as specific public policy approaches which may promote effective engagement among nonresident fathers.

Next Steps for Research

The Fragile Families and Child Wellbeing Study is the most complete and comprehensive study on nonresident fathers to date. However, the study is not without its limitations, particularly as it relates to father-reported measures. A key next step for future research is a better assessment of father-report of father engagement. Specifically, future research needs to work to ensure that the magnitude of the response concerning father's-report of nonresident father engagement is comparable to that of mother's-report, so that the former can be used alongside the latter in describing patterns of father engagement.

The absence of height and weight data for fathers represents another important research gap which future research should work to fill. Recent research indicates that paternal obesity risk is predictive of child obesity risk, so BMI data on nonresident fathers represents an important area for future research.[144]

Data concerning the patterns of nonresident father engagement at later child ages (i.e., beyond adolescence) as well as the effect of such engagement on child health outcomes are additional critical research areas. Similarly, data concerning the patterns and influence of additional forms of father social engagement, such as talking on the phone, email messages and text messages are also warranted.

Although this thesis focused on the impact that nonresident father engagement has on children, a notable gap within the public health literature is the effect which father engagement may have on fathers themselves. In other words, how does nonresident father engagement influence the health of nonresident fathers? A logical subsequent step to this research is an assessment which nonresident father engagement may have on the health and wellbeing of resident mothers.

Another notable omission from the literature on father engagement and child health is a qualitative assessment of the effects of nonresident father engagement and absence. Specifically, as the findings of this thesis demonstrate, quantitative data analysis may demonstrate that nonresident father engagement in reading books may foster child academic achievement. However, qualitative analysis can provide insight into *why* this relationship exists. For example, qualitative analysis may reveal that children tend to report a desire to demonstrate their growing proficiency in reading to their fathers, and that they value the reward of praise given to them from their fathers for their accomplishments. Similarly, quantitative assessment may indicate

that nonresident father engagement in playing video games and watching TV may increase child obesity risk, as this the findings of this thesis suggest. However, qualitative investigation can provide insight into the "*why?*". To illustrate, qualitative analyses may indicate that children tend report that their fathers engagement in these activities with them (e.g., playing video games and watching TV) provided a sense of endorsement and validation of these activities, which thereby increased the frequency in which children engaged in them (even without their fathers presences), as they were regarded as favorable and approved activities.

The utility of qualitative research may also extend to other health outcomes that are associated with father engagement. For example, father absence is associated with an increased risk of behavior problems in school and teenage pregnancy.[148,149] Qualitative assessment may reveal that children tend to have feelings of abandonment, lack of validation and/or insecurity when their fathers of less involved, which in turn may trigger negative coping behaviors such as being disruptive in school and engaging in higher-risk sexual behaviors.[154,155]

In all, although the Fragile Families Study provides unprecedented insight into the characteristics of nonresident fathers, there is ample room, and considerable need, for additional research.

Next Steps for Policy

A more robust exploration of both the quantitative and qualitative impact of nonresident father engagement on health outcomes is not only critical for public health research, but is also important in terms of making effective and appropriate public policy decisions. There are three primary tools through which policies affecting nonresident fathers and their children can be influenced, legislation, regulation, and litigation.

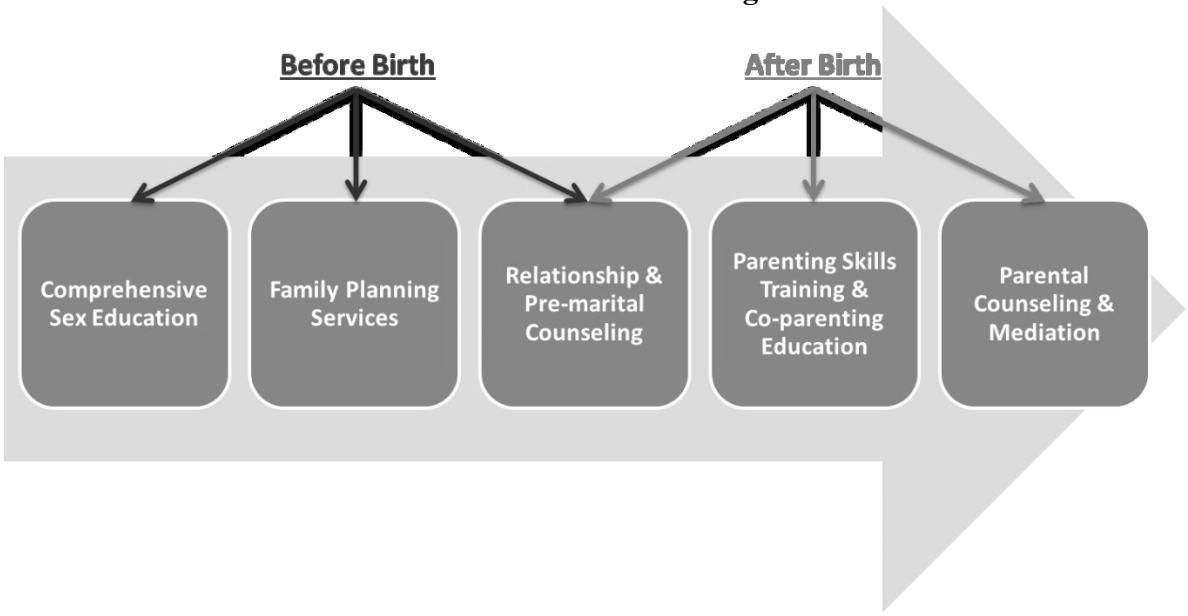
Legislation refers to the act of drafting bills and proposals with the intent to create laws which change the policy landscape (cite). There are a number of legislative acts which could be used to influence nonresident father engagement. First, legislation to promote comprehensive sex education−which emphasizes relationship-building techniques and safer sex practices−in public schools could be used as policy-building technique to reduce the incidence of unplanned pregnancies, which increase the risk of father absence. Similarly, legislation to promote the coverage of family planning services by health insurance plans could also be used as policy tool to reduce unplanned pregnancies. Legislation to promote relationship and parental counseling can be used as a policy measure to address pregnancies which come to term. Specifically, legislative acts to include counseling services for expecting mothers (and fathers) alongside other prenatal health care services that are covered by health insurance plans could be used as a policy measure to reduce father absenteeism.

Regulation refers to act of inciting policy change through regulatory authorities. The Office of Child Support Enforcement (OCSE) is the federal agency responsible for regulating child support payments from noncustodial parents (the vast majority of which are fathers), and coordinates payments with local child support offices within each of the fifty states.[38] This existing child support oversight that is granted to this agency can be used to encourage co-parenting counseling services among parents who do not reside together. Specifically, the OCSE can use its regulatory oversight to include co-parenting counseling services as an option for parents who would like to reach mutual agreements concerning parenting responsibilities, without pursing legal actions each other. As the OCSE currently enforces financial involvement only, offering assistance to promote the social involvement of noncustodial parents would represent a profound policy influence on nonresident father engagement.[38]

Litigation involves using law or the legal system to promote policy change. The legal system is one of the primary places in which nonresident father involvement is currently realized, through the establishment of paternity, physical and legal custody, visitation and orders of child support.[150] Similar to the policy recommendation of using regulation to encourage co-parenting counseling, litigation can be used to promote mediation services between parents during family court proceedings. Lawyers have a fiduciary duty to act solely in their client's interest.[151] Thus, in family court proceedings, the lawyers appointed for contesting parents have a legal obligation to seek a ruling in favor of the parent they represent, a system which usually inherently predisposes one parent from having equal amount of social involvement compared to the other.[157] Mediators on the other hand, are neutral parties, with a vested interest in negotiating an agreement which maximizes the interests of all parties involved, including the child.[152] Whereas lawyers are bound to secure custody and child support rulings in favor of the parent which they represent (in family court proceedings), mediators are charged with securing an arrangement which maximizing the welfare and perceived benefit parents, children and everyone else with a vested interest.[157,158] Thus, to summarize, the use of mediators in family court proceedings is a policy measure with potential to promote father engagement and a more harmonious relationship amongst parents who do not live together.

It is important to understand that the policy response to the issue of nonresident father engagement can be initiated at a variety of different levels. As Figure 9 demonstrates, policies which promote nonresident engagement and reduce father absenteeism can be effectual further upstream before children are even born.

Figure 9. Policy intervention points to affect nonresident father engagement and child health & wellbeing.



In conclusion, there a number of policy measures which are available to improve engagement amongst nonresident fathers, . Policies which ensure that the engagement from nonresident residents is delivered in a fashion which promotes positive health outcomes amongst their children may be a logical subsequent step, following clearer guidance from research concerning the most optimal means of engagement (e.g., watching TV versus reading books).

VII. CHAPTER SEVEN: APPENDIX

VII.a. Tables

Table A1. Univariate analysis for Aim 1, at age 1. (n=3,287)[a]				
Dependent Variables				
Father Engagement	**n[b]**	**%[c]**	**$\bar{X}$[d]**	**95% CI**
Play games	2,768	94	4.9	4.8 – 4.9
Sing songs	2,333	79	3.4	3.3 – 3.5
Read books	2,030	69	2.4	2.3 – 2.5
Tell stories	2,167	74	2.7	2.6 – 2.8
Play inside	2,716	92	4.9	4.8 – 5.0
Change diapers	2,593	88	4.7	4.6 – 4.8
Hug	2,859	97	6.2	6.1 – 6.3
Any activity	2,872	98	6.2	6.1 – 6.3
Missing	348	11%		
Independent Variables of Interest				
Father Residency	**n**	**%**	**$\bar{X}$**	**95% CI**
Resident father	2,328	71		
Nonresident father	959	29		
Missing	0	0%		
Father Race/Ethnicity	**n**	**%**	**$\bar{X}$**	**95% CI**
Black	1,529	47		
Hispanic	898	27		
White	716	22		
Other	144	4		
Missing	0	0%		
Control Variables				
Father Age	**n**	**%**	**$\bar{X}$**	**95% CI**
Overall			29.1	28.9 – 29.4
Less than 30 years	1,909	58		
30 years and above	1,378	42		
Missing	0	0%		
Father Education	**n**	**%**	**$\bar{X}$**	**95% CI**
Less than high school	953	29		
High school	1,192	36		
Some college or more	1,142	35		
Missing	0	0%		
Father Incarcerated	**n**	**%**	**$\bar{X}$**	**95% CI**
Yes	166	5		
No	3,121	95		
Missing	0	0%		

Father's Relationship with Child's Mother	n	%	$\bar{x}$	95% CI
Excellent, Very good or Good	2,374	80		
Fair or Poor	421	20		
Missing	492	16%		
Father Married to Child's Mother	**n**	**%**	**$\bar{x}$**	**95% CI**
Yes	1,166	65		
No	1,121	35		
Missing	0	0%		
Father has Other Children	**n**	**%**	**$\bar{x}$**	**95% CI**
Yes	1,037	32		
No	2,169	68		
Missing	81	2%		
Child's Gender	**n**	**%**	**$\bar{x}$**	**95% CI**
Boy	1,704	52		
Girl	1,583	48		
Missing	0	0%		
Mother Engagement[e]	**n[f]**	**%[g]**	**$\bar{x}$[h]**	**95% CI**
Play games	3,196	98	6.0	6.0 – 6.1
Sing songs	3,131	96	5.6	5.5 – 5.6
Read books	2,935	90	4.2	4.1 – 4.3
Tell stories	2,739	84	3.8	3.7 – 3.9
Play inside	3,163	97	5.9	5.8 – 6.0
Hug	3,219	99	6.9	6.9 – 6.9
Any activity	3,242	99	6.9	6.9 – 6.9
Missing	26	<1%		

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Number of fathers who engaged in that activity with child at least one day per week.

[c]Percent of fathers who engaged in that activity with child at least one day per week.

[d]Mean number of days that fathers engaged in that activity with child per week.

[e]Mother's engagement in the activity of "changing diapers" was not assessed at the age 1 interview.

[f]Number of mothers who engaged in that activity with child at least one day per week.

[g]Percent of mothers who engaged in that activity with child at least one day per week.

[h]Mean number of days that mothers engaged in that activity with child per week.

Table A2. Univariate analysis for Aim 1, at age 3. (n=3,165)[a]				
Dependent Variables				
Father Engagement	**n[b]**	**%[c]**	**$\bar{x}$[d]**	**95% CI**
Play games	2,206	84	3.6	3.5 – 3.7
Sing songs	2,180	83	3.2	3.1 – 3.3
Read books	2,127	81	3.1	3.0 – 3.2
Tell stories	2,104	80	3.1	3.0 – 3.2
Play inside	2,390	91	4.1	4.0 – 4.2
Help with chores	2,094	80	3.4	3.3 – 3.5

Hug	2,547	97	6.1	6.0 – 6.2
Any activity	2,565	97	6.1	6.0 – 6.2
Missing	539	17%		
Independent Variables of Interest				
Father Residency	**n**	**%**	**$\bar{x}$**	**95% CI**
Resident father	2,020	64		
Nonresident father	1,145	36		
Missing	0	0%		
Father Race/Ethnicity	**n**	**%**	**$\bar{x}$**	**95% CI**
Black	1,534	48		
Hispanic	810	26		
White	686	22		
Other	135	4		
Missing	0	0%		
Control Variables				
Father Age	**n**	**%**	**$\bar{x}$**	**95% CI**
Overall			31.0	30.8 – 31.3
Less than 30 years	1,550	49		
30 years and above	1,615	51		
Missing	0	0%		
Father Education	**n**	**%**	**$\bar{x}$**	**95% CI**
Less than high school	870	28		
High school	1,175	37		
Some college or more	1,120	36		
Missing	0	0%		
Father Incarcerated	**n**	**%**	**$\bar{x}$**	**95% CI**
Yes	214	7		
No	2,951	93		
Missing	0	0%		
Father's Relationship with Child's Mother	**n**	**%**	**$\bar{x}$**	**95% CI**
Excellent, Very good or Good	2,512	87		
Fair or Poor	381	13		
Missing	272	9%		
Father Married to Child's Mother	**n**	**%**	**$\bar{x}$**	**95% CI**
Yes	1,219	39		
No	1,946	61		
Missing	0	0%		
Father has Other Children	**n**	**%**	**$\bar{x}$**	**95% CI**
Yes	1,166	38		
No	1,939	62		
Missing	60	2%		
Child's Gender	**n**	**%**	**$\bar{x}$**	**95% CI**
Boy	1,650	52		

Girl	1,515	48		
Missing	0	0%		
Mother Engagement	**n[e]**	**%[f]**	**$\bar{X}$[g]**	**95% CI**
Play games	2,823	91	4.7	4.6 – 4.7
Sing songs	2,090	97	5.3	5.2 – 5.3
Read books	3,003	97	5.3	5.2 – 5.3
Tell stories	2,792	90	4.5	4.4 - 4.6
Play inside	2,978	96	5.5	5.4 – 5.5
Help with chores	2,970	96	5.3	5.2 – 5.3
Hug	3,069	99	6.9	6.9 – 6.9
Any activity	3,083	99	6.9	6.9 – 6.9
Missing	63	2%		

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Number of fathers who engaged in that activity with child at least one day per week.

[c]Percent of fathers who engaged in that activity with child at least one day per week.

[d]Mean number of days that fathers engaged in that activity with child per week.

[e]Number of mothers who engaged in that activity with child at least one day per week.

[f]Percent of mothers who engaged in that activity with child at least one day per week.

[g]Mean number of days that mothers engaged in that activity with child per week.

Table A3. Univariate analysis for Aim 1, at age 5. (n=2,993)[a]				
Dependent Variables				
Father Engagement	**n[b]**	**%[c]**	**$\bar{X}$[d]**	**95% CI**
Sing songs	1,793	76	2.5	2.4 – 2.6
Read books	1,863	79	2.6	2.5 – 2.7
Tell stories	1,910	81	2.8	2.7 – 2.8
Play inside	2,028	86	3.3	3.2 – 3.4
Take to event	2,122	90	2.3	2.3 – 2.4
Play outside	2,075	88	2.9	2.9 – 3.0
Watch TV	2,169	92	3.9	3.8 – 4.0
Any activity	2,264	96	3.9	3.8 – 4.0
Missing	635	21%		
Independent Variables of Interest				
Father Residency	**n**	**%**	**$\bar{X}$**	**95% CI**
Resident father	1,605	54		
Nonresident father	1,388	46		
Missing	0	0%		
Father Race/Ethnicity	**n**	**%**	**$\bar{X}$**	**95% CI**
Black	1,468	49		
Hispanic	789	26		
White	617	21		
Other	119	4		

Missing	0	0%		
Control Variables				
Father Age	**n**	**%**	**$\bar{x}$**	**95% CI**
Overall			33.1	32.9 – 33.4
Less than 30 years	1,111	37		
30 years and above	1,882	63		
Missing	0	0%		
Father Education	**n**	**%**	**$\bar{x}$**	**95% CI**
Less than high school	828	28		
High school	1,085	36		
Some college or more	1,080	36		
Missing	0	0%		
Father Incarcerated	**n**	**%**	**$\bar{x}$**	**95% CI**
Yes	213	7		
No	2,780	93		
Missing	0	0%		
Father's Relationship with Child's Mother	**n**	**%**	**$\bar{x}$**	**95% CI**
Excellent, Very good or Good	2,319	79		
Fair or Poor	598	21		
Missing	76	3%		
Father Married to Child's Mother	**n**	**%**	**$\bar{x}$**	**95% CI**
Yes	1,158	39		
No	1,835	61		
Missing	0	0%		
Father has Other Children	**n**	**%**	**$\bar{x}$**	**95% CI**
Yes	1,201	40		
No	1,767	60		
Missing	25	1%		
Child's Gender	**n**	**%**	**$\bar{x}$**	**95% CI**
Boy	1,564	52		
Girl	1,429	48		
Missing	0	0%		
Mother Engagement	**n[e]**	**%[f]**	**$\bar{x}^{g}$**	**95% CI**
Sing songs	2,815	96	4.6	4.5 – 4.7
Read books	2,873	98	4.8	4.7 – 4.8
Tell stories	2,697	92	4.2	4.1 – 4.3
Play inside	2,756	94	4.7	4.6 – 4.8
Take to event	2,881	99	3.3	3.2 – 3.3
Play outside	2,750	94	3.8	3.7 – 3.9
Watch TV	2,903	99	5.3	5.2 – 5.4
Any activity	2,920	99	5.3	5.2 – 5.4
Missing	61	2%		

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Number of fathers who engaged in that activity with child at least one day per week.
[c]Percent of fathers who engaged in that activity with child at least one day per week.
[d]Mean number of days that fathers engaged in that activity with child per week.
[e]Number of mothers who engaged in that activity with child at least one day per week.
[f]Percent of mothers who engaged in that activity with child at least one day per week.
[g]Mean number of days that mothers engaged in that activity with child per week.

Table A4. Univariate analysis for Aim 1, at age 9. (n=2,421)[a]				
Dependent Variables				
Father Engagement	**n[b]**	**%[c]**	**$\bar{x}$**	**95% CI**
Read books	803	40		
Play inside	622	31		
Help with chores	783	39		
Watch TV	1,284	64		
Talk about day	1,525	76		
Play outside	1,024	51		
Play video games	723	36		
Any activity	1,607	80		
Missing	414	17%		
Independent Variables of Interest				
Father Residency	**n**	**%**	**$\bar{x}$**	**95% CI**
Resident father	1,234	51		
Nonresident father	1,187	49		
Missing	0	0%		
Father Race/Ethnicity	**n**	**%**	**$\bar{x}$**	**95% CI**
Black	1,187	49		
Hispanic	604	25		
White	541	22		
Other	89	4		
Missing	0	0%		
Control Variables				
Father Age	**n**	**%**	**$\bar{x}$**	**95% CI**
Overall			37.5	37.2 – 37.8
Less than 30 years	275	11		
30 years and above	2,146	89		
Missing	0	0%		
Father Education	**n**	**%**	**$\bar{x}$**	**95% CI**
Less than high school	441	18		
High school	687	28		
Some college or more	1,293	53		
Missing	0	0%		
Father Incarcerated	**n**	**%**	**$\bar{x}$**	**95% CI**

Yes	54	2		
No	2,367	98		
Missing	0	0%		
Father's Relationship with Child's Mother	**n**	**%**	**$\bar{x}$**	**95% CI**
Excellent, Very good or Good	1,772	76		
Fair or Poor	549	24		
Missing	100	4%		
Father Married to Child's Mother	**n**	**%**	**$\bar{x}$**	**95% CI**
Yes	944	39		
No	1,477	61		
Missing	0	0%		
Father has Other Children	**n**	**%**	**$\bar{x}$**	**95% CI**
Yes	1,158	48		
No	1,254	52		
Missing	9	<1%		
Child's Gender	**n**	**%**	**$\bar{x}$**	**95% CI**
Boy	1,250	52		
Girl	1,171	48		
Missing	0	0%		
Mother Engagement	**n[d]**	**%[e]**	**$\bar{x}$**	**95% CI**
Read books	2,046	85		
Play inside	1,396	58		
Help with chores	1,950	81		
Watch TV	2,190	91		
Talk about day	2,359	98		
Play outside	1,492	62		
Play video games	1,011	42		
Any activity	2,400	99		
Missing	14	<1%		

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Number of fathers who engaged in that activity with child at least one day per week.

[c]Percent of fathers who engaged in that activity with child at least one day per week.

[d]Number of mothers who engaged in that activity with child at least one day per week.

[e]Percent of mothers who engaged in that activity with child at least one day per week.

Table A5. Bivariate analysis for Aim 1, at age 1. (n=3,287)[a]									
	Resident Fathers (n=2,328)				**Nonresident Fathers (n=959)**				
Dependent Variables									
Father Engagement	**n[b]**	**%[c]**	**$\bar{x}$[d]**	**95% CI**	**n**	**%**	**$\bar{x}$**	**95% CI**	**p-**

									value
Play games†	2158	98	5.4	5.3 – 5.5	610	83	2.8	2.6 – 3.0	<0.000
Sing songs†	1850	84	3.7	3.6 – 3.9	483	66	2.0	1.8 – 2.2	<0.000
Read books†	1607	73	2.6	2.5 – 2.7	423	57	1.5	1.3 – 1.7	<0.000
Tell stories†	1718	78	3.0	2.8 – 3.1	449	61	1.7	1.5 – 1.8	<0.000
Play inside†	2114	96	5.4	5.3 – 5.5	602	82	2.9	2.7 – 3.1	<0.000
Change diapers†	2026	92	5.1	5.0 – 5.3	567	77	2.9	2.7 – 3.1	<0.000
Hug†	2180	99	6.8	6.7 – 6.8	679	92	4.0	3.8 – 4.2	<0.000
Any activity†	2190	99	6.8	6.7 – 6.8	682	93	4.0	3.8 – 4.2	<0.000
missing	126	5%			222	23%			
Independent Variables of Interest									
Father Race/Ethnicity*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Black	894	38			635	66			
Hispanic	714	31			184	19			
White	615	26			101	11			<0.000
Other	105	5			39	4			
missing	0	0%			0	0%			
Control Variables									
Father Age*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Overall			29.8	29.5 – 30.1			27.4	27.0 – 27.9	
Less than 30 years	1,227	53			682	71			<0.000
30 years and above	1,101	47			277	29			
missing	0	0%			0	0%			
Father Education*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Less than high school	643	28			310	32			
High school	763	33			429	45			<0.000
Some college or more	922	40			220	23			
missing	0	0%			0	0%			
Father Incarcerated*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Yes	38	2			128	13			
No	2,290	98			831	87			<0.000
missing	0	0%			0	0%			
Father's Relationship with Child's Mother*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	
Excellent, Very good or Good	1,860	93			514	65			<0.000
Fair or Poor	142	7			279	35			
missing	326	14%			166	17%			

Father Married to Child's Mother*	n	%	$\bar{x}$	95% CI	n	%	$\bar{x}$	95% CI	p-value
Yes	1,153	50			13	1			
No	1,175	50			946	99			<0.000
missing	0	0%			0	0%			
Father has Other Children*	**n**	**%**	$\bar{x}$	**95% CI**	**n**	**%**	$\bar{x}$	**95% CI**	**p-value**
Yes	621	27			416	46			
No	1,689	73			480	54			<0.000
missing	18	<1%			63	7%			
Child's Gender	**n**	**%**	$\bar{x}$	**95% CI**	**n**	**%**	$\bar{x}$	**95% CI**	**p-value**
Boy	1,213	52			491	51			
Girl	1,115	48			468	49			0.337
missing	0	0%			0	0%			
Mother Engagement[e]	**n[f]**	**%[g]**	$\bar{x}^h$	**95% CI**	**n**	**%**	$\bar{x}$	**95% CI**	**p-value**
Play games	2278	98	6.1	6.0 – 6.1	918	98	6.0	5.9 – 6.1	0.216
Sing songs†	2249	97	5.7	5.6 – 5.8	876	94	5.3	5.2 – 5.5	0.041
Read books	2068	89	4.2	4.1 – 4.3	867	92	4.1	3.9 – 4.2	0.225
Tell stories	1952	84	3.8	3.7 – 3.9	787	84	3.8	3.6 – 3.9	0.317
Play inside	2254	97	6.0	5.9 – 6.0	909	97	5.8	5.6 – 5.9	0.052
Hug	2296	99	6.9	6.9 – 6.9	923	99	6.8	6.8 – 6.9	0.093
Any activity	2310	99	6.9	6.9 – 6.9	932	99	6.8	6.8 – 6.9	0.112
missing	4	<1%			22	3%			

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Number of fathers who engaged in that activity with child at least one day per week.

[c]Percent of fathers who engaged in that activity with child at least one day per week.

[d]Mean number of days that fathers engaged in that activity with child per week.

[e]Mother's engagement in the activity of "changing diapers" was not assessed at the age 1 interview.

[f]Number of mothers who engaged in that activity with child at least one day per week.

[g]Percent of mothers who engaged in that activity with child at least one day per week.

[h]Mean number of days that mothers engaged in that activity with child per week.

†Statistically significant difference between resident and nonresident in that activity at the p<0.05 level.

*Statistically significant difference between resident and nonresident in that variable at the p<0.05 level.

Table A6. Bivariate analysis for Aim 1, at age 3. (n=3,165)[a]

	Resident Fathers (n=2,020)				Nonresident Fathers (n=1,145)				
Dependent Variables									
Father Engagement	**n[b]**	**%[c]**	$\bar{x}^d$	**95% CI**	**n**	**%**	$\bar{x}$	**95% CI**	**p-value**
Play games†	1636	89	4.0	3.9 – 4.1	570	72	2.3	2.1 – 2.5	<0.000

Sing songs†	1654	90	3.6	3.5 – 3.7	525	67	1.6	1.5 – 1.8	<0.000
Read books†	1581	86	3.4	3.3 – 3.5	546	69	1.9	1.8 – 2.1	<0.000
Tell stories†	1544	84	3.4	3.3 – 3.5	560	71	1.9	1.8 – 2.1	<0.000
Play inside†	1728	94	4.5	4.4 – 4.6	662	84	2.7	2.6 – 2.9	<0.000
Help with chores†	1575	86	3.8	3.7 – 3.9	513	65	2.1	1.9 – 2.3	<0.000
Hug†	1820	99	6.7	6.7 – 6.8	728	92	3.9	3.7 – 4.0	<0.000
Any activity†	1829	99	6.7	6.7 – 6.8	736	93	3.9	3.7 – 4.0	<0.000
missing	182	9%			357	31%			
Independent Variables of Interest									
Father Race/Ethnicity*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Black	768	38			766	67			
Hispanic	610	30			200	17			
White	551	27			135	12			<0.000
Other	91	5			44	4			
missing	0	0%			0	0%			
Control Variables									
Father Age*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Overall			32.0	31.7 – 32.3			29.3	28.9 – 29.8	
Less than 30 years	831	41			719	63			<0.000
30 years and above	1,189	59			426	37			
missing	0	0%			0	0%			
Father Education*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Less than high school	531	26			339	30			
High school	641	32			534	47			<0.000
Some college or more	848	42			272	24			
missing	0	0%			0	0%			
Father Incarcerated*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Yes	31	2			183	16			
No	1,989	98			962	84			<0.000
missing	0	0%			0	0%			
Father's Relationship with Child's Mother*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Excellent, Very good or Good	1,887	94			625	70			<0.000
Fair or Poor	118	6			263	30			
missing	15	<1%			257	22%			
Father Married to Child's Mother*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Yes	1,207	60			12	<1			<0.000

No	813	40			1,133	99			
missing	0	0%			0	0%			
Father has Other Children*	**n**	**%**	**$\bar{x}$**	**95% CI**	**n**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Yes	571	28			595	59			
No	1,433	72			506	51			<0.000
missing	16	<1%			44	4%			
Child's Gender	**n**	**%**	**$\bar{x}$**	**95% CI**	**n**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Boy	1,049	52			601	52			
Girl	971	48			544	48			0.963
missing	0	0%			0	0%			
Mother Engagement	**n[e]**	**%[f]**	**$\bar{x}$[g]**	**95% CI**	**n**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Play games†	1873	93	4.8	4.7 – 4.9	950	87	4.5	4.3 – 4.6	0.046
Sing songs	1974	98	5.3	5.2 – 5.4	1066	98	5.2	5.2 – 5.4	0.623
Read books	1940	97	5.3	5.2 – 5.4	1063	98	5.2	5.1 – 5.3	0.445
Tell stories	1820	91	4.6	4.5 – 4.7	972	89	4.4	4.3 – 4.6	0.291
Play inside	1933	96	5.4	5.4 – 5.5	1044	96	5.5	5.4 – 5.6	0.552
Help with chores	1913	95	5.3	5.2 – 5.4	1057	97	5.2	5.1 – 5.3	0.208
Hug	1994	99	6.9	6.9 – 6.9	1075	99	6.9	6.9 – 6.9	0.522
Any activity	2006	99	6.9	6.9 – 6.9	1077	99	6.9	6.9 – 6.9	0.613
missing	6	<1%			57	5%			

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Number of fathers who engaged in that activity with child at least one day per week.

[c]Percent of fathers who engaged in that activity with child at least one day per week.

[d]Mean number of days that fathers engaged in that activity with child per week.

[e]Number of mothers who engaged in that activity with child at least one day per week.

[f]Percent of mothers who engaged in that activity with child at least one day per week.

[g]Mean number of days that mothers engaged in that activity with child per week.

†Statistically significant difference between resident and nonresident in that activity at the p<0.05 level.

*Statistically significant difference between resident and nonresident in that variable at the p<0.05 level.

Table A7. Bivariate analysis for Aim 1, at age 5. (n=2,993)[a]

	Resident Fathers (n=1,605)				**Nonresident Fathers (n=1,388)**				
Dependent Variables									
Father Engagement	**n[b]**	**%[c]**	**$\bar{x}$[d]**	**95% CI**	**n**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Sing songs†	1195	86	3.0	2.9 – 3.1	598	62	1.4	1.3 – 1.6	<0.000
Read books†	1222	88	3.0	2.9 – 3.1	641	66	1.5	1.4 – 1.7	<0.000
Tell stories†	1236	89	3.2	3.1 – 3.2	674	70	1.7	1.6 – 1.8	<0.000
Play inside†	1278	92	3.9	3.7 – 4.0	750	77	2.1	2.0 – 2.3	<0.000
Take to event†	1330	96	2.6	2.6 – 2.7	789	81	1.7	1.6 – 1.8	<0.000

Play outside†	1306	94	3.3	3.2 – 3.4	769	79	2.1	2.0 – 2.3	<0.000
Watch TV†	1333	96	4.4	4.3 – 4.5	836	86	2.7	2.6 – 2.9	<0.000
Any activity†	1368	98	4.3	4.2 – 4.4	896	92	2.4	2.3 – 2.6	<0.000
missing	216	13%			419	30%			
Independent Variables of Interest									
Father Race/Ethnicity*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Black	558	35			910	66			
Hispanic	473	29			290	21			
White	499	31			144	10			<0.000
Other	75	5			44	3			
missing	0	0%			0	0%			
Control Variables									
Father Age*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Overall			34.4	34.1 – 31.7			31.7	31.3 – 32.1	
Less than 30 years	437	27			674	49			<0.000
30 years and above	1,168	73			714	51			
missing	0	0%			0	0%			
Father Education*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Less than high school	420	26			408	29			
High school	449	28			636	46			<0.000
Some college or more	736	46			344	25			
missing	0	0%			0	0%			
Father Incarcerated*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Yes	13	<1			200	14			
No	1,592	99			1,188	86			<0.000
missing	0	0%			0	0%			
Father's Relationship with Child's Mother*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Excellent, Very good or Good	1,512	94			807	61			<0.000
Fair or Poor	90	6			508	39			
missing	3	<1%			73	5%			
Father Married to Child's Mother*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Yes	1,127	70			31	2			
No	478	30			1,357	98			<0.000
missing	0	0%			0	0%			

Father has Other Children*	**n**	**%**	**$\bar{x}$**	**95% CI**	**n**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Yes	420	26			781	57			
No	1,180	74			587	43			<0.000
missing	5	<1%			20	<1%			
Child's Gender	**n**	**%**	**$\bar{x}$**	**95% CI**	**n**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Boy	840	52			724	55			
Girl	765	48			664	50			0.624
missing	0	0%			0	0%			
Mother Engagement	**n[e]**	**%[f]**	**$\bar{x}$[g]**	**95% CI**	**n**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Sing songs	1550	97	4.6	4.5 – 4.8	1265	95	4.6	4.5 – 4.7	0.842
Read books	1566	98	4.9	4.8 – 5.0	1307	98	4.6	4.5 – 4.8	0.052
Tell stories†	1486	93	4.3	4.2 – 4.4	1211	91	4.1	4.0 – 4.2	0.049
Play inside	1518	95	4.7	4.6 – 4.8	1238	93	4.7	4.6 – 4.8	0.947
Take to event	1570	98	3.3	3.2 – 3.4	1311	98	3.2	3.1 – 3.3	0.139
Play outside†	1534	96	3.9	3.8 – 4.0	1216	91	3.7	3.5 – 3.8	0.048
Watch TV†	1582	99	5.0	4.9 – 5.1	1321	99	5.6	5.5 – 5.7	<0.000
Any activity†	1592	99	5.0	4.9 – 5.1	1328	99	5.6	5.5 – 5.7	<0.000
missing	7	<1%			54	4%			

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Number of fathers who engaged in that activity with child at least one day per week.

[c]Percent of fathers who engaged in that activity with child at least one day per week.

[d]Mean number of days that fathers engaged in that activity with child per week.

[e]Number of mothers who engaged in that activity with child at least one day per week.

[f]Percent of mothers who engaged in that activity with child at least one day per week.

[g]Mean number of days that mothers engaged in that activity with child per week.

†Statistically significant difference between resident and nonresident in that activity at the p<0.05 level.

*Statistically significant difference between resident and nonresident in that variable at the p<0.05 level.

Table A8. Bivariate analysis for Aim 1, at age 9. (n=2,421)[a]

	Resident Fathers (n=1,234)				**Nonresident Fathers (n=1,187)**				
Dependent Variables									
Father Engagement	**n[b]**	**%[c]**	**$\bar{x}$[d]**	**95% CI**	**n**	**%**	**$\bar{x}$**	**95% CI**	**p-value**
Read books†	608	53			194	23			<0.000
Play inside†	471	41			151	18			<0.000
Help with chores†	608	53			174	20			<0.000
Watch TV†	964	84			320	37			<0.000
Talk about day†	1068	93			458	53			<0.000
Play outside†	792	69			231	27			<0.000
Play video games†	505	44			217	25			<0.000
Any activity†	1125	98			482	56			<0.000
missing	142	12%			272	23%			

Independent Variables of Interest									
Father Race/Ethnicity*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Black	420	34			767	65			
Hispanic	382	31			222	19			
White	379	31			162	14			<0.000
Other	53	4			36	3			
missing	0	0%			0	0%			
Control Variables									
Father Age*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Overall			39.1	38.7 – 39.5			35.8	35.4 – 36.2	
Less than 30 years	78	6			197	17			<0.000
30 years and above	1,156	94			990	83			
missing	0	0%			0	0%			
Father Education*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Less than high school	220	18			221	19			
High school	271	22			416	35			<0.000
Some college or more	743	60			550	46			
missing	0	0%			0	0%			
Father Incarcerated*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Yes	7	<1			47	4			
No	1,227	99			1,140	96			<0.000
missing	0	0%			0	0%			
Father's Relationship with Child's Mother*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Excellent, Very good or Good	1,157	94			615	56			<0.000
Fair or Poor	75	6			474	44			
missing	2	<1%			98	8%			
Father Married to Child's Mother*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Yes	944	76			0	0			
No	290	24			1,187	100			<0.000
missing	0	0%			0	0%			
Father has Other Children*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Yes	347	28			811	69			
No	887	72			367	31			<0.000
missing	0	0%			9	0%			
Child's Gender*	**n**	**%**	**x̄**	**95% CI**	**n**	**%**	**x̄**	**95% CI**	**p-value**
Boy	654	53			596	50			0.452

Girl	580	47			591	50			
missing	0	0%			0	0%			
Mother Engagement	**n[e]**	**%[f]**	**$\bar{X}$[g]**	**95% CI**	**n**	**%**	**$\bar{X}$**	**95% CI**	**p-value**
Read books	1,060	86			986	84			0.632
Play inside	715	58			681	58			0.948
Help with chores	998	81			952	80			0.747
Watch TV	1,121	91			1,069	93			0.522
Talk about day	1,207	98			1,152	98			0.921
Play outside†	850	69			642	55			<0.000
Play video games	480	39			531	45			0.067
Any activity	1,220	99			1,180	99			0.981
missing	2	<1%			12	<1%			

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Number of fathers who engaged in that activity with child at least one day per week.

[c]Percent of fathers who engaged in that activity with child at least one day per week.

[d]Mean number of days that fathers engaged in that activity with child per week.

[e]Number of mothers who engaged in that activity with child at least one day per week.

[f]Percent of mothers who engaged in that activity with child at least one day per week.

[g]Mean number of days that mothers engaged in that activity with child per week.

†Statistically significant difference between resident and nonresident in that activity at the p<0.05 level.

*Statistically significant difference between resident and nonresident in that variable at the p<0.05 level.

Table A9. Father engagement at focal child age 3, by father residency. (n=3,165)[a,b,c]

	Resident Fathers (n=2,020)		**Nonresident Fathers** (n=1,145)		
Father Engagement[d]	**pp[e,f](%)**	**95% CI**	**pp[e,f](%)**	**95% CI**	**p-value**
Play games*	91	86 – 96	69	63 – 75	<0.000
Sing songs*	92	87 – 97	68	62 – 74	<0.000
Read books*	89	84 – 94	65	59 – 71	<0.000
Tell stories*	87	82 – 92	72	66 – 78	<0.000
Play inside*	97	92 – 100	80	74 – 86	<0.000
Help with chores*	88	83 – 93	67	61 – 73	<0.000
Hug	99	94 – 100	91	85 – 97	0.187
Any activity	99	94 – 100	92	86 – 98	0.259
missing	9%		31%		

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Data are weighted to be representative of births occurring in US cities with populations over 200,000.

[c]Data are adjusted for father age, father education, father incarceration, father being married to child's mother, father's relationship with child's mother, father having other children and mother engagement.

[d]"How many days per week does child's father usually play inside with toys such as blocks or legos with child?"

[e]Predicted probablity of father engaging in that activity with child at least one day per week.

[f]Predicted probabilities generated from results of logistic regression. Chi-square tests used to assess statistical significance between resident and nonresident fathers.

*Statistically significant difference between resident and nonresident in that activity at the p<0.05 level.

Table A10. Father engagement at focal child age 5, by father residency. (n=2,993)[a,b,c]					
	Resident Fathers (n=1,605)		Nonresident Fathers (n=1,388)		
Father Engagement[d]	**pp[e,f](%)**	**95% CI**	**pp[e,f](%)**	**95% CI**	**p-value**
Sing songs*	86	81 – 91	62	56 – 68	<0.000
Read books*	88	83 – 93	66	60 – 72	<0.000
Tell stories*	89	84 – 94	70	64 – 76	<0.000
Play inside*	92	87 – 97	77	71 – 83	<0.000
Take to event*	96	91 – 100	81	75 – 87	<0.000
Play outside*	94	89 – 99	79	73 – 85	<0.000
Watch TV	96	91 – 100	86	81 – 92	0.123
Any activity	98	93 – 100	92	86 – 98	0.289
missing	13%		30%		

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Data are weighted to be representative of births occurring in US cities with populations over 200,000.

[c]Data are adjusted for father age, father education, father incarceration, father being married to child's mother, father's relationship with child's mother, father having other children and mother engagement.

[d]"How many days per week does child's father usually play inside with toys such as blocks or legos with child?"

[e]Predicted probablity of father engaging in that activity with child at least one day per week.

[f]Predicted probabilities generated from results of logistic regression. Chi-square tests used to assess statistical significance between resident and nonresident fathers.

*Statistically significant difference between resident and nonresident in that activity at the p<0.05 level.

Table A11. Sensitivity analysis comparing father engagement at least one day per week to at least four days per week.[a,b.c.d]			
	Age 1 (n=3287)	**Age 3** (n=3165)	**Age 5** (n=2993)
	pp[e,f] (95%CI)	**pp[e,f] (95%CI)**	**pp[e,f] (95%CI)**
Play inside			
>/=4x per week			
Resident	88% (83%-92%)*	86% (80%-90%)*	80% (72%-88%)*
Nonresident	47% (40%-53%)	45% (38%-51%)	40% (32%-47%)
>/=1x per week			
Resident	96% (91%-100%)*	97% (92%-100%)*	92% (87%-97%)*
Nonresident	78% (72%-84%)	80% (74%-86%)	77% (71%-83%)
Read books			
>/=4x per week			
Resident	44% (38%-50%)*	66% (60%-71%)*	62% (58%-67%)*
Nonresident	14% (6%-21%)	20% (13%-26%)	17% (11%-23%)
>/=1x per week			
Resident	74% (69%-79%)*	89% (84%-94%)*	88% (83%-93%)*
Nonresident	56% (50%-62%)	65% (59%-71%)	66% (60%-72%)
Play inside or Read books			

>/=4x per week			
Resident	89% (84%-94%)*	87% (81%-92%)*	82% (76%-87%)*
Nonresident	48% (42%-54%)	46% (41%-52%)	42% (35%-48%)
>/=1x per week			
Resident	98% (93%-100%)*	98% (95%-100%)*	95% (90%-100%)*
Nonresident	80% (74%-86%)	82% (76%-88%)	79% (73%-85%)

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.
[b]Data are weighted to be representative of births occurring in US cities with populations over 200,000.
[c]Data are adjusted for father age, father education, father race, father incarceration, mother age, mother education, mother race, couple marital status, couple relationship quality, child sex, and father having other children.
[d]Example survey question: "How many days per week does child's father usually play inside with toys such as blocks or legos with child?"
[e]Predicted probablity of father engaging in that activity with child at least one day per week.
[f]Predicted probabilities generated from results of logistic regression. Chi-square tests used to asses statistical significance within ages and adjusted Wald tests used to asses significance between ages.
*Statistically significant difference between resident and nonresident in that age group and in that activity at the p<0.05 level.
**There were no statistically significant differences between age groups.
***The sensitivity analysis using different cut point criteria for father engagement (>/=4x per week versus >/=1x per week) revealed no statistically significant differences.

Table A12. Analysis of missing data to assess non-response bias.[a,b.c.d,*]

	Age 1 (n=3287)		**Age 3** (n=3165)		**Age 5** (n=2993)		**Age 9** (n=2421)	
	Included (n=2939)	Missing (n=348)	Included (n=2626)	Missing (n=539)	Included (n=2358)	Missing (n=635)	Included (2007)	Missing (n=414)
Father Residency (%)								
Resident father	71	68	64	60	54	51	51	55
Nonresident father	29	32	36	36	46	49	49	45
Father Race/Ethnicity (%)								
Black	47	50	48	50	49	53	49	51
Hispanic	27	29	26	30	26	28	25	27
White	22	18	22	17	21	17	22	20
Other	4	3	4	3	4	2	4	2
Father Age (%)								
Less than 30 years	58	60	49	52	37	40	11	12
30 years and above	42	40	51	48	63	60	89	88
Father Education (%)								
Less than high school	29	30	28	29	28	28	18	19
High school	36	40	37	40	36	39	28	30
Some college or more	35	30	36	31	36	33	53	51
Father Incarcerated (%)								
Yes	5	8	7	10	7	9	2	4

No	95	92	93	90	93	91	98	96
Father's Relationship with Child's Mother (%)								
Excellent, Very good or Good	80	75	87	82	79	76	76	72
Fair or Poor	20	25	13	18	21	24	24	28
Father Married to Child's Mother (%)								
Yes	65	61	39	34	39	33	39	33
No	35	39	61	66	61	67	61	67
Father has Other Children (%)								
Yes	32	36	38	43	40	45	48	50
No	68	64	62	57	60	55	52	50
Child's Gender (%)								
Boy	52	51	52	50	52	51	52	49
Girl	48	49	48	50	48	49	48	51

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.
[b]Data are weighted to be representative of births occurring in US cities with populations over 200,000.
[c] "Missing" refer to data for which report of father engagement are missing.
[d] "Included" refer to data for which report of father engagement are not missing.
*There were no statistically significant differences between "Missing" and "Included" dat.

Table A13. Comparison of father engagement among nonresident fathers, by father relationship with child's mother at focal child age 9. [a,b,c]

	Positive (n=615)		**Negative** (n=474)		
Father Engagement[d]	**pp[e,f](%)**	**95% CI**	**pp[e,f]**	**95% CI**	**p-value**
Read books	26	20 – 32	20	15 – 26	0.354
Play inside*	25	20 – 31	12	9 – 17	0.011
Help with chores	23	18 – 27	17	12 – 22	0.219
Watch TV	40	35 – 46	35	29 – 40	0.308
Talk about day*	60	54 – 65	48	42 – 53	0.048
Play outside	28	23 – 33	26	21 – 32	0.653
Play video games	26	20 – 31	25	19 – 31	0.913
Any activity*	63	58 – 68	51	46 – 56	0.04
missing	20%		23%		

[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.
[b]Data are weighted to be representative of births occurring in US cities with populations over 200,000.
[c]Data are adjusted for father age, father education, father incarceration, father being married to child's mother, father's relationship with child's mother, father having other children and mother engagement.
[d]"How many days per week does child's father usually play inside with toys such as blocks or legos with child?"

[e]Predicted probablity of father engaging in that activity with child at least one day per week.

[f]Predicted probabilities generated from results of logistic regression. Chi-square tests used to assess statistical significance between fathers with a positive versus negative relationship with their child's mother.

*Statistically significant difference fathers with a positive versus negative relationship with their child's mother at the p<0.05 level.

Table A14. Model specification for the association between father residency and father engagement.

$$\text{Father Engagement}_i = B_0 + B_1\text{FatherResidency}_i + B_2\text{FatherRace}_i + B_3\text{Controls}_i + e_i$$

Table A15. Value labels for variables used in the model specification for the association between father residency and father engagement.

Father Engagement: the odds of father engaging in said activity with child at least one day per week

- 0=Not engaged
- 1=Engaged

***B*$_1$FatherResidency:** father's current residency status

- 0=Nonresident
- 1=Resident

***B*$_2$FatherRace:** father's race/ethnicity

- 1=White
- 2=Black
- 3=Hispanic
- 4=Other race

***B*$_2$Controls:** control variables

- Father age, Father education, Father incarceration status, Father relationship with child's mother, Father married to child's mother, Father has other children, Child gender, Mother engagement

Table A16. Model specification for the association between father engagement and child academic achievement among nonresident fathers.

$$\text{(log) Child Academic Achievement}_i = B_0 + B_1\text{FatherEngagement}_i + B_2\text{FatherRace}_i + B_3\text{Controls}_i + e_i$$

Table A17. Value labels for variables used in the model specification for the association between father engagement and child academic achievement among nonresident fathers.

Child Academic Achievement: the odds of child having a above-average score on WJ-III test of reading or math achievement.

- 0=Average score or above
- 1=Below-average score

***B_1*FatherEngagment:** Father engaged in any activity with child at least one day per week.

- 0=Not engaged
- 1=Engaged

***B_2*FatherRace:** father's race/ethnicity

- 1=White
- 2=Black
- 3=Hispanic
- 4=Other race

***B_2*Controls:** control variables

- Father age, Father education, Father incarceration status, Father relationship with child's mother, Father married to child's mother, Father has other children, Child gender, Mother engagement

Table A18. Model specification for the association between father engagement and child obesity risk among nonresident fathers.

$$\text{Child Obesity Risk}_i = B_0 + B_1\text{FatherEngagement}_i + B_2\text{FatherRace}_i + B_3\text{Controls}_i + e_i$$

Table A19. Value labels for variables used in the model specification for the association between father engagement and child obesity risk among nonresident fathers.

Child Obesity Risk: the odds of child being at or above the 85th percentile on the CDC growth-for-age-chart (95th percentile for obesity).

- 0=Below Risk
- 1=At or Above Risk

***B_1*FatherEngagment:** Father engaged in any activity with child at least one day per week.

- 0=Not engaged
- 1=Engaged

***B_2*FatherRace:** father's race/ethnicity

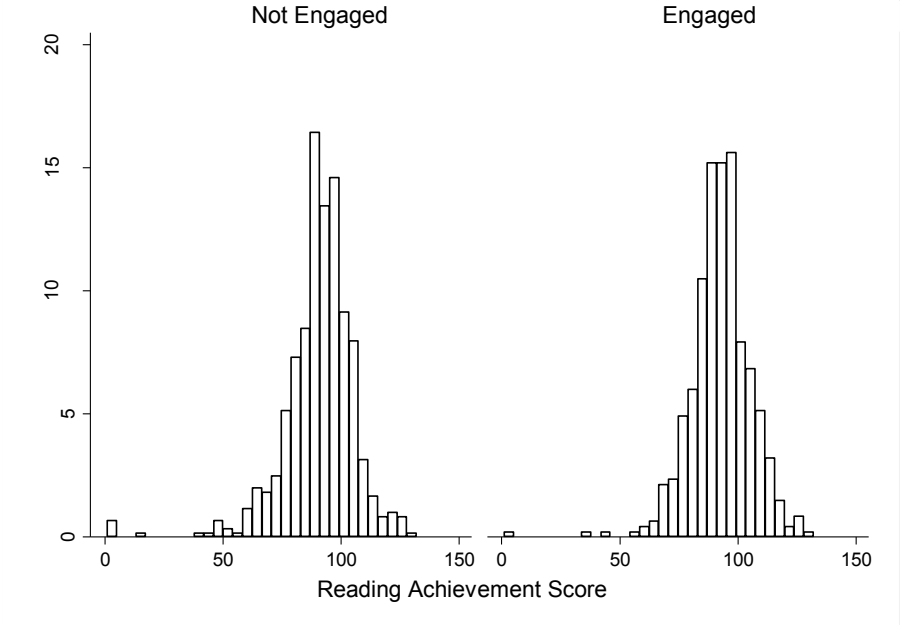
- 1=White
- 2=Black
- 3=Hispanic
- 4=Other race

***B_2*Controls:** control variables

- Father age, Father education, Father incarceration status, Father relationship with child's mother, Father married to child's mother, Father has other children, Mother BMI, Child gender, Mother engagement

VII.b. Figures

Figure A1. Distribution of child reading achievement by father engagement among nonresident fathers.[a,b,c,d]



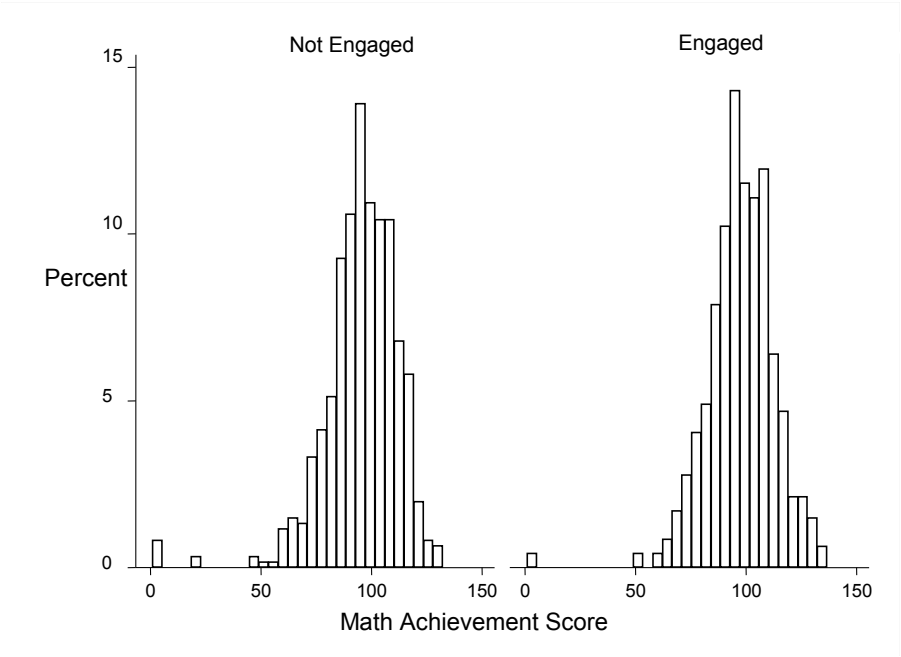
[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Reading achievement measured by child's standardized score on the Woodcock Johnson III ,Test 9 (average score is 90-110; scores range from 70-130).

[c]There is no statistically significant difference in reading achievement scores by father engagement.

[d]Engagement defined by participation in at least one activity with child (see Table 2).

Figure A2. Distribution of child math achievement by father engagement among nonresident fathers.[a,b,c,d]



[a]Data comes from the Fragile Family and Child Wellbeing Study (FFCWS): 1998-2010.

[b]Math achievement measured by child's standardized score on the Woodcock Johnson III ,Test 10 (average score is 90-110; scores range from 70-130).

[c]There is no statistically significant difference in math achievement scores by father engagement.

[d]Engagement defined by participation in at least one activity with child (see Table 2).

VIII. CHAPTER EIGHT: CITATIONS

[1] Jones J and Mosher W. Fathers' involvement with their children: U.S., 2006–2010. National Health Statistics Reports. 2013;71:1-21. Available at http://www.cdc.gov/nchs/data/nhsr/nhsr071.pdf. Accessed 01/23/14.

[2]The Forgotten Middle Ensuring that All Students Are on Target for College and Career Readiness before High School. American College Testing Program (ACT). Available at http://www.act.org/research/policymakers/pdf/ForgottenMiddle.pdf. Accessed September 14, 2012.

[3] Zajacova A, Humer R and Rogers R. Education and health among U.S. working-age adults: A detailed portrait across the full educational attainment spectrum. Biodemography Soc Biol. 2012;58(1):40-61.

[4] Thomson E, Hanson T and McLanahan S. Family Structure and Child Well-Being: Economic Resources vs. Parental Behaviors. Social Forces. 1994;73-221-242.

[5] Wang L, Chyen D, Lee S and Lowry R. The Association Between Body Mass Index in Adolescence and Obesity in Adulthood. Journal of Adolescent Health. 2008;42:512-518.

[6] Trust for America's Health. Racial and Ethnic Disparities in Obesity. Available at http://healthyamericans.org/pages/?id=250. Accessed 02/11/14.

[7] Fragile Families and Child Wellbeing Study. Publications. Available at http://www.fragilefamilies.princeton.edu/publications.asp. Accessed 03/07/15.

[8] Stykes B, Manning W and Brown S. Estimating Nonresident Fatherhood: Evidence from the CPS, NSFG, and SIPP. National Center for Family & Marriage Research. Available at http://www.bgsu.edu/content/dam/BGSU/college-of-arts-and-sciences/NCFMR/documents/Manning/Estimating-Nonresident-Fatherhood.pdf. Accessed 01/23/14.

[9] National Center for Health Statistics. National Survey for Family Growth−Publications and Information Products. Available at http://www.cdc.gov/nchs/nsfg/nsfg_products.htm#cycle1. Accessed 01/23/14.

[10] U.S. Census. Living Arrangements of Families. Available at https://www.census.gov/hhes/families/data/children.html. Accessed 01/24/13.

[11] McLanahan S. Family Instability and Complexity after a Nonmarital Birth: Outcomes for Children in Fragile Families. Carlson and England (eds.). Social Class and Changing Families in an Unequal America. Stanford, CA: Stanford University Press. 2011:108-133.

[12] King V, Harris K and Heard H. Racial and ethnic diversity in nonresident father involvement. Journal of Marriage and Family. 2004;66:1-21.

[13] Fagan J, Roy K, Palkovitz R and Farrie D. Pathways to paternal engagement: longitudinal effects of risk and resilience on nonresident fathers. Developmental Psychology. 2009;45:1389-1405.

[14] Cabrera N, Shannon D, Vogel C et al. Low-income fathers' involvement in their toddlers' lives: biological fathers from the early head start research and evaluation study. Fathering. 2004;1:5-30.

[15] Cabrera N, Ryan R, Mitchell S et al. Low-income, nonresident father involvement with their toddlers: Variation by fathers' race and ethnicity. Journal of Family Psychology. 2008;22:643-47.

[16] Tach L, Mincy R and Edin K. Parenting as a "package deal": relationships, fertility, and nonresident father involvement among unmarried parents. Demography. 2010;47(1):181–204.

[17] Cook K. Discrepancy between expected and actual child support payments: predicting the health and health-related quality of life of children living in low-income, single-parent families. Child Care Health Dev. 2008;34 (2):267-75.

[18] Cancian M, Yang M and Slack K. The effect of additional child support income on the risk of child maltreatment. Social Service Review. 2013;87: 417-37.

[19] Thomson E, Hanson T and McLanahan S. Family structure and child well-being: economic resources vs. parental behaviors. Social Forces. 1994;73:221-42.

[20] Jackson A. The effects of nonresident father involvement on single black mothers and their young children. Social Work. 1999;44:156-66.

[21] Choi J and Jackson A. Fathers' involvement and child behavior problems in poor African American single-mother families. Children and Youth Services Review. 2011;33:698-704.

[22] Jackson A, Preston K and Thomas C. Single mothers, nonresident fathers, and preschoolers' socioemotional development: social support, psychological well-being, and parenting quality. Journal of Social Service Research. 2013;39:129–140.

[23] King V and Sobolewski J. Nonresident fathers' contributions to adolescent well-being. Journal of Marriage and Family. 2006;68:537-57.

[24] Menning C. Nonresident fathering and school failure. Journal of Family Issues. 2006;27:1356-82.

[25] Coley R and Medeiros B. Reciprocal longitudinal relations between nonresident father involvement and adolescent delinquency. Child Development. 2007;78:132-47.

[26] Thomas G, Farrell M and Barnes G. The effects of single-mother families and nonresident fathers on delinquency and substance abuse in black and white adolescents. 1996;58:884-94.

[27] Menning C and Stewart S. Nonresident father involvement, social class, and adolescent. Journal of Family Issues. 2008;29:1673:1700.

[28] Stewart S and Menning C. Family structure, nonresident father involvement, and adolescent eating patterns. Journal of Adolescent Health. 2009;45:193-201.

[29] Garasky S and Stewart S. Evidence of the Effectiveness of Child Support and Visitation: Examining Food Insecurity among Children with Nonresident Fathers. J Fam Econ Iss. 2007; 28:105-121.

[30] Nepomnyaschy L, Miller D, Garasky D, and Nanda N. Nonresident Fathers and Child Food Insecurity: Evidence from Longitudinal Data. Social Service Review. 2014:88:92-133.

[31] The Future of Children. Healthy Marriage Programs: Learning what works. Available at https://futureofchildren.org/futureofchildren/publications/docs/15_02_08.pdf. Accessed 02/04/14.

[32] Administration for Children and Families: Office of Family Assistance. Healthy Marriage Demonstration Grants. Available at http://www.acf.hhs.gov/programs/ofa/programs/healthy-marriage/healthy-marriage. Accessed 02/04/14.

[33] Mathematica Policy Research. The Long-Term Effects of Building Strong Families: A Relationship Skills Education Program for Unmarried Parents. Available at http://www.mathematica-mpr.com/publications/PDFs/family_support/BSF_36month_impact_fnlrpt.pdf. Accessed 02/04/14.

[34] Administration for Children and Families: Office of Planning, Research and Evaluation. The Community Healthy Marriage Initiative Evaluation: Impacts of a Community Health Approach to Strengthening Families. Available at http://www.acf.hhs.gov/sites/default/files/opre/chmi_impactreport.pdf. Accessed 02/04/14.

[35] Administration for Children and Families: Office of Planning, Research and Evaluation. Available at http://www.acf.hhs.gov/sites/default/files/opre/early_impacts_low.pdf. Accessed 02/04/13

[36] Congressional Research Service. Fatherhood Initiatives: Connecting Fathers to Their Children. Available at https://www.fas.org/sgp/crs/misc/RL31025.pdf. Accessed 02/05/14.

[37] Administration for Children and Families: Office of Family Assistance. Healthy Marriage & Responsible Fatherhood. Available at http://www.acf.hhs.gov/programs/ofa/programs/healthy-marriage. Accessed 02/05/14.

[46] Office of Child Support Enforcement. History. Available at http://www.acf.hhs.gov/programs/css/about/history. Accessed 02/17/14.

[39] U.S. Census Bureau. Custodial Mothers and Fathers and their Child Support. Available at https://www.census.gov/prod/2013pubs/p60-246.pdf. Accessed 02/17/14.

[40] National Center for Education Statistics. Degrees Conferred by Sex and Race. Available at http://nces.ed.gov/fastfacts/display.asp?id=72. Accessed December 31, 2014.

[41] The Robert Wood Johnson Foundation. Food Insecurity and Risk for Obesity Among Children and Families: Is There a Relationship? Available at http://www.rwjf.org/content/dam/farm/reports/reports/2010/rwjf58903. Accessed December 31, 2014.

[42] McLeroy K, Bibeau D, Steckler A and Glanz K. An ecological perspective on health promotion programs. Health Education & Behavior. 1988;15(4):351-377.

[43] Clarke P. Child Custody between Unmarried Parents. Available at http://www.legalmatch.com/law-library/article/child-custody-between-unmarried-parents.html. Accessed December 14, 2014.

[44] U.S. Census. Custodial Mothers and Fathers and their Child Support: 2009. Available at http://www.census.gov/prod/2011pubs/p60-240.pdf. Accessed December 14, 2014.

[45] Reichman N, Teitler J, Garfinkel I and McLanahan S. Fragile Families: Sample and Design. Children and Youth Services Review. 2001;23:303-26.

[46] U.S. Census Bureau. Annual Estimates of the Resident Population for Incorporated Places of 50,000 or More: 2013. Available at http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk. Accessed 01/10/15.

[47] The Fragile Family and Child Wellbeing Study. Year 9 Survey Components. Available at http://www.fragilefamilies.princeton.edu/y9survey.asp. Accessed 02/05/14.

[48] Fragile Families. Scales Documentation And Question Sources For One-Year Questionnaires. Available at http://www.fragilefamilies.princeton.edu/documentation/core/scales/ff_1yr_scales.pdf. Accessed 02/07/14.

[49] Arizona School of Social and Family Dynamics. HOME Inventory. Available at http://fhdri.clas.asu.edu/home/index.html. Accessed 02/07/14.

[50] Totsika V and Sylva K. The Home Observation for Measurement of the Environment Revisited. Child and Adolescent Mental Health. 2004;9:25-35.

[51] The Fragile Families and Child Wellbeing Study. Mothers' Baseline Survey. Available at http://www.fragilefamilies.princeton.edu/documentation/core/questionnaires/ffmombspv3_2013.pdf. Accessed 02/07/14.

[52] The Fragile Families and Child Wellbeing Study. Mothers' Nine-Year Follow-Up Survey. Available at http://www.fragilefamilies.princeton.edu/documentation/year9/ff_biomom_9ypv1.pdf. Accessed 02/07/14.

[53] Hernandez D and Coley R. A multidimensional measure of father involvement among low-income families: Who is a reliable and valid reporter? Available at http://paa2005.princeton.edu/papers/51144. Accessed 02/09/14.

[54] Woodcock R, McGrew K and Mather N. Woodcock-Johnson III Tests of Achievement. 2001: Itasca, IL; Riverside Publishing.

[55] Eau Claire School District. WJ-III Test of Achievement. available at http://www.ecasd.k12.wi.us/student_services/assessments/WJ-III%20Tests%20of%20Achievement.pdf. Accessed 02/11/04.

[56] Woodcock-Johnshon III Normative Update. Available at http://www.riverpub.com/products/wjIIIComplete/details.html. Accessed 02/11/14.

[57] The Fragile Families and Child Wellbeing Study. Scales Documentation and Question Sources for the Nine-Year Wave of the Fragile Families and Child Wellbeing Study. Available at http://www.fragilefamilies.princeton.edu/documentation/year9/ff_9yr_scales_2013.pdf. Accessed 02/11/14.

[58] Elgar F, Roberts C, Tudor-Smith C and Moore L. Validity of self-reported height and weight and predictors of bias in adolescents. Journal of Adolescent Health. 2005;37:371-75.

[59] Gorber S, Tremblay M, Moher D and Gorber B. A comparison of direct vs. self-report measures for assessing height, weight and body mass index: a systematic review. 2007;8:307-26.

[60] The Fragile Families and Child Wellbeing Study. Study Design. Available at http://www.fragilefamilies.princeton.edu/study_design.asp. Accessed 02/11/14.

[61] Centers for Disease Control and Prevention. How is childhood overweight and obesity measured? Available at http://www.cdc.gov/obesity/childhood/basics.html. Accessed 01/29/14.

[62] McLanahan S and Beck A. Parental Relationships in Fragile Families. Future Child. 2010; 20(2): 17–37.

[63] U.S. Census Burreau. Income Measurement Error in Surveys. Available at https://www.census.gov/srd/papers/pdf/sm97-05.pdf. Accessed 01/03/15.

[64] Swisher R and Waller M. Confining Fatherhood Incarceration and Paternal Involvement Among Nonresident White, African American, and Latino Fathers. Journal of Family Issues. 2008;29:10067-1088.

[65] Tach L, Mincy R and Edin K. Parenting As A "Package Deal": Relationships, Fertility, And Nonresident Father Involvement Among Unmarried Parents. Demography. 2010;47:181-204.

[66] Rouyer V, Frascarolo F, Zaouche-Gaudron C and Lavanchy C. Fathers of Girls, Fathers of Boys: Influence of Child's Gender on Fathers' Experience of, Engagement in, and Representations of Paternity. Swiss Journal of Psychology. 2007;66:225-33.

[67] Schaefer-Graf M, Pawliczak J, Passow D et al. Birth Weight and Parental BMI Predict Overweight in Children From Mothers With Gestational Diabetes. Diabetes Care. 2005;28:1745–1750,

[68] S Danielzik, K Langnäse, M Mast, C Spethmann, M Müller. Impact of parental BMI on the manifestation of overweight 5–7 year old children. European Journal of Nutrition. 2002;41:132-38.

[69] Centers for Disease Control and Prevention. Defining Overweight and Obesity: Definitions for Adults. Available at http://www.cdc.gov/obesity/adult/defining.html. Accessed 01/29/14.

[70] Institute for Digital Research and Education. Stata Data Examples: Ordered Logistic Regression. Available at http://www.ats.ucla.edu/stat/stata/dae/ologit.htm. Accessed 01/29/14.

[71] Institute for Digital Research and Education. Using Margins for Predicted Probabilities. Available at http://www.ats.ucla.edu/stat/stata/dae/predictive_margins.htm. Accessed 02/19/14.

[72] Centers for Disease Control and Prevention. Overweight and Obesity: Causes and Consequences. Available at http://www.cdc.gov/obesity/adult/causes/. Accessed 01/03/15.

[73] National Institutes of Health. Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. Available at http://www.cdc.gov/obesity/adult/causes/. Accessed 01/03/15.

[74] Freedman D, Kettel L, Serdula M et al. The relation of childhood BMI to adult adiposity: the Bogalusa Heart Study. *Pediatrics*. 2005;115:22–27.

[75] Daniels S, Arnett D, Eckel R et al. Overweight in children and adolescents: pathophysiology, consequences, prevention, and treatment. *Circulation*. 2005;111;1999–2002.

[76] Dietz W. Overweight in childhood and adolescence. New England Journal of Medicine 2004;350:855-857.

[77] Jasik C and Lustig R. Adolescent obesity and puberty: the "perfect storm". *Ann N Y Acad Sci*. 2008;1135:265-279.

[78] Osborne C and McLanahan S. Partnership instability and child well-being. Journal of Marriage and Family. 2207;69:1065.

[79]Harper C and McLanahan S. Father Absence and Youth Incarceration. Journal of Research on Adolescence. 2204;14:369-397.

[80] Stewart S and Menning C. Family structure, nonresident father involvement, and adolescent eating patterns. Journal of Adolescent Health. 2009;45:193-201.

[81]Carlson M. Family structure, father involvement, and adolescent behavioral outcomes. Journal of Marriage and Family. 2006;68:137-154.

[82] National Center for Education Statistics. Degrees Conferred by Sex and Race. Available at http://nces.ed.gov/fastfacts/display.asp?id=72. Accessed December 31, 2014.

[83] Reichman N, Teitler J, Garfinkel I and McLanahan S. Fragile Families: Sample and Design. Children and Youth Services Review. 2001;23:303-26.

[84] Fragile Families. Scales Documentation And Question Sources For One-Year Questionnaires. Available at http://www.fragilefamilies.princeton.edu/documentation/core/scales/ff_1yr_scales.pdf. Accessed 02/07/14.

[85] Arizona School of Social and Family Dynamics. HOME Inventory. Available at http://fhdri.clas.asu.edu/home/index.html. Accessed 02/07/14.

[86] Totsika V and Sylva K. The Home Observation for Measurement of the Environment Revisited. Child and Adolescent Mental Health. 2004;9:25-35.

[87] US Census. The Black Population: 2010. Available at http://www.census.gov/prod/cen2010/briefs/c2010br-06.pdf. Accessed 01/11/05.

[88] US Census. The Hispanic Population: 2010. Available at http://www.census.gov/prod/cen2010/briefs/c2010br-04.pdf. Accessed 01/11/05.

[89] Martens E, Pestman W, de Bour A, et al. Systematic differences in treatment effect estimates between propensity score methods and logistic regression. Int J Epidemiol. 2008;37:1142-1147.

[90] Kent D, Trikalinos T and Hill M. Are unadjusted analyses of clinical trials inappropriately biased towards the null? Stroke. 2009;40:672-673.

[91] Pappas G, Queen S, Hadden W and Fisher G. The Increasing disparity in mortality between socioeconomic groups in the U.S., 1960 and 1986. *New Eng J Med*. 1993;329:103-109.

[92] Choi A, Weekley C, Shu-Cheng C, et al. Association of educational attainment with chronic disease and mortality: The Kidney Early Evaluation Program (KEEP). Am J Kidney Dis. 2011;58(2):228-234.

[93] Choi A, Weekley C, Shu-Cheng C, et al. Association of educational attainment with chronic disease and mortality: The Kidney Early Evaluation Program (KEEP). Am J Kidney Dis. 2011;58(2):228-234.

[94] Choi A, Weekley C, Shu-Cheng C, et al. Association of educational attainment with chronic disease and mortality: The Kidney Early Evaluation Program (KEEP). Am J Kidney Dis. 2011;58(2):228-234.

[95] House J, Lantz P and Herd P. Continuity and change in the social stratification of aging and health over the life course: evidence from a nationally representative longitudinal study from 1986 to 2001/2002 (Americans' Changing Lives Study). *J Gerontol B Psychol Sci Soc Sci*. 2005;60(Spec No 2):15-26.

[96] Educational Projects in Education Research Center. National Graduation Rate Rebounds;

1.2 Million Students Still Fail to Earn Diplomas. Available at http://www.edweek.org/media/diplomascount2011_pressrelease.pdf. Accessed May 22, 2014.

[97] Lloyd D. Prediction of School failure from third-grade data. educational and psychological measurement 1978;38,:1193-2000.

[98] Hernandez J, Double Jeopardy: How Third-Grade Reading Skills and Poverty Influence High School Graduation. The Annie E. Casey Foundation; Centerfor Demographic Analysis, University at Albany, State of New York; Foundation for Child Development. Available at http://www.aecf.org/KnowledgeCenter/Publications.aspx?pubguid={8E2B6F93-75C6-4AA6-8C6E-CE88945980A9}. Accessed 05/22/14.

[99]The Forgotten Middle Ensuring that All Students Are on Target for College and Career Readiness before High School. American College Testing Program (ACT). Available at http://www.act.org/research/policymakers/pdf/ForgottenMiddle.pdf. Accessed September 14, 2012.

[100] Zajacova A, Humer R and Rogers R. Education and health among U.S. working-age adults: A detailed portrait across the full educational attainment spectrum. Biodemography Soc Biol. 2012;58(1):40-61.

[101] Reichman N, Teitler J, Garfinkel I and McLanahan S. Fragile Families: Sample and Design. Children and Youth Services Review. 2001;23:303-26.

[102] Fragile Families. Scales Documentation And Question Sources For One-Year Questionnaires. Available at http://www.fragilefamilies.princeton.edu/documentation/core/scales/ff_1yr_scales.pdf. Accessed 02/07/14.

[103] Arizona School of Social and Family Dynamics. HOME Inventory. Available at http://fhdri.clas.asu.edu/home/index.html. Accessed 02/07/14.

[104] Totsika V and Sylva K. The Home Observation for Measurement of the Environment Revisited. Child and Adolescent Mental Health. 2004;9:25-35.

[105] Woodcock R, McGrew K and Mather N. Woodcock-Johnson III Tests of Achievement. 2001: Itasca, IL; Riverside Publishing.

[106] Eau Claire School District. WJ-III Test of Achievement. available at http://www.ecasd.k12.wi.us/student_services/assessments/WJ-III%20Tests%20of%20Achievement.pdf. Accessed 02/11/04.

[107] US Census. The Black Population: 2010. Available at http://www.census.gov/prod/cen2010/briefs/c2010br-06.pdf. Accessed 01/11/15.

[108] US Census. The Hispanic Population: 2010. Available at http://www.census.gov/prod/cen2010/briefs/c2010br-04.pdf. Accessed 01/11/15.

[109] US Department of Education. No Child Left Behind. Available at http://www2.ed.gov/nclb/landing.jhtml. Accessed 01/11/15.

[110] Economic Policy Institute. For Public Schools, Segregation Then, Segregation Since. Available at http://www.epi.org/publication/unfinished-march-public-school-segregation/. Accessed 01/15/15.

[111] Haomiao J and Lubetkin E. Trends in quality-qdjusted life-years lost contributed by smoking and obesity. *Am J Prev Med*. 2010;38(2):138-44.

[112] Centers for Disease Control and Prevention. Prevalence of Obesity Among Children and Adolescents: U.S., Trends 1963-1965 Through 2009-2010. Available at http://www.cdc.gov/nchs/data/hestat/obesity_child_09_10/obesity_child_09_10.htm. Accessed 05/25/14.

[113] Flegal K, Carrol M, Ogden C and Johnson C. Prevalence and trends in obesity among US adults, 1999-2000. JAMA. 2002;288:1723-1727.

[114] Rahmouni K, Correia M, Haynes W, and Allyn M. Obesity-associated hypertension. *Hypertension.* 2005;45:9-14.

[115] Winter Y, Rohrmann S, and Linseisen J. Contribution of obesity and abdominal fat mass to risk of stroke and transient ischemic attacks. *Stroke*. 2008;39:3145-3151.

[116] Y Li, J Rana, J Manson, et al. Obesity as compared with physical activity in predicting risk of coronary heart disease in women. *Circulation*. 2006;113:499-506.

[117] Carr M and Brunzell J. Abdominal obesity and dyslipidemia in the metabolic Syndrome: importance of type 2 diabetes and familial combined hyperlipidemia in coronary artery disease risk. *The J Cln End & Metabolism*. 2004; 89(6):2601-2607.

[118] Pitt H. Hepato-pancreato-biliary fat: the good, the bad and the ugly. *HPB: J Int Hepato Pancreato Biliary Ass*. 2007;9:92-97.

[119] Abrass C. Overview: obesity: what does it have to do with kidney disease? *J Am Soc Nephrol*. 2004;15:2768-72.

[120] Bianchini F, Kaaks R, and Vainio H. Overweight, obesity, and cancer risk. Lan. 2002;3(9):565-574

[121] Gilliland F, Berhane K, Islam T, et al Obesity and the risk of newly diagnosed asthma in school-age children. *Am J Epidemiol*. 2003;158:406-15.

[122] Hannon T, Rao G, and Arslanian S. Childhood obesity and type 2 diabetes mellitus. *Pediatrics*. 2005;116:473-80.

[123] Halbower A, Sundaram S, Polotsky V, Smith P. Management of obesity and childhood obstructive sleep apnea: the dangerous combination. *Obesity Management*. 2008;4(6): 338-43.

[124] Taylor E, Theim K, Mirch M, et al. Orthopedic complications of overweight in children and adolescents. *Pediatrics*. 2006;117:2167-74.

[125] Sjöberg R, Nilsson K, and Leppert J. Obesity, shame, and depression in school-aged children: a population-based study. *Pediatrics*. 2005;116;e389-e92.

[126] Strauss R. Childhood obesity and self-esteem. *Pediatrics*. 2000;105;e15.

[127] Solorzano C and McCartney C. Obesity and the pubertal transition in girls and boys. U.S. Library of Medicine. Available at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2931339/. Accessed May 28, 2012.

[128] Fontaine K, Redden D, Wang C, et al. Years of life loss due to obesity. *JAMA*. 2003;289(2):187-193.

[129] Herman K, Craig C, Gauvin L, and Katzmarzyk P. Tracking of obesity and physical activity from childhood to adulthood: The Physical Activity Longitudinal Study. *International Journal of Pediatric Obesity*. 2009; 4: 281-88.

[130] Reichman N, Teitler J, Garfinkel I and McLanahan S. Fragile Families: Sample and Design. Children and Youth Services Review. 2001;23:303-26.

[131] Fragile Families. Scales Documentation And Question Sources For One-Year Questionnaires. Available at http://www.fragilefamilies.princeton.edu/documentation/core/scales/ff_1yr_scales.pdf. Accessed 02/07/14.

[132] Arizona School of Social and Family Dynamics. HOME Inventory. Available at http://fhdri.clas.asu.edu/home/index.html. Assessed 02/07/14.

[133] Totsika V and Sylva K. The Home Observation for Measurement of the Environment Revisited. Child and Adolescent Mental Health. 2004;9:25-35.

[134] The Fragile Families and Child Wellbeing Study. Scales Documentation and Question Sources for the Nine-Year Wave of the Fragile Families and Child Wellbeing Study. Available at http://www.fragilefamilies.princeton.edu/documentation/year9/ff_9yr_scales_2013.pdf. Accessed 02/11/14.

[135] Elgar F, Roberts C, Tudor-Smith C and Moore L. Validity of self-reported height and weight and predictors of bias in adolescents. Journal of Adolescent Health. 2005;37:371-75.

[136] Gorber S, Tremblay M, Moher D and Gorber B. A comparison of direct vs. self-report measures for assessing height, weight and body mass index: a systematic review. 2007;8:307-26.

[137] The Fragile Families and Child Wellbeing Study. Study Design. Available at http://www.fragilefamilies.princeton.edu/study_design.asp. Accessed 02/11/14.

[138] US Census. The Black Population: 2010. Available at http://www.census.gov/prod/cen2010/briefs/c2010br-06.pdf. Accessed 01/11/05.

[139] US Census. The Hispanic Population: 2010. Available at http://www.census.gov/prod/cen2010/briefs/c2010br-04.pdf. Accessed 01/11/05.

[140] Vollmer R, Adamsons K, Gorin A et al. Investigating the relationship of body mass index, diet quality, and physical activity level between fathers and their preschool-aged children. Journal of the Academy of Nutrition and Dietetics. 2015;S:1811-15.

[141] Indiana Rules of Court. Indiana Parenting Guidelines. Available at www.in.gov/judiciary/rules/parenting/. Accessed 01/15/15.

[142] US Census. The Black Population: 2010. Available at http://www.census.gov/prod/cen2010/briefs/c2010br-06.pdf. Accessed 01/11/05.

[143] US Census. The Hispanic Population: 2010. Available at http://www.census.gov/prod/cen2010/briefs/c2010br-04.pdf. Accessed 01/11/05.

[144] Janssen I, Craig W, Boyce W and Pickett W. Associations between overweight and obesity with bullying behaviors in school-aged children. Pediatrics. 2004;113(5):1187-1194.

[145] Lumeng J, Forrest P, Appugliese D et al. Weight status as a predictor of being bullied in third through sixth grades. Pediatrics. 2010; 125:e1301–e1307.

[146] Indiana Rules of Court. Indiana Parenting Guidelines. Available at www.in.gov/judiciary/rules/parenting/. Accessed 01/15/15.

[147] U.S. Census. America's Families and Living Arrangements. Available at http://www.census.gov/prod/2013pubs/p20-570.pdf. Accessed 03/08/15.

[148] Osborne C and McLanahan, S. Partnership instability and child well-being. Journal of Marriage and Family. 2007; 69:1065-1083.

[149] Teachman J. The childhood living arrangements of children and the characteristics of their marriages. Journal of Family Issues. 2004;25:86-111.

[150] American Bar Association. Family Law in the 50 States. Available at http://www.americanbar.org/groups/family_law/resources/family_law_in_the_50_states.html. Accessed 03/14/15.

[151] Cornell University Law School. Fiduciary Duty. Available at https://www.law.cornell.edu/wex/fiduciary_duty. Accessed 03/14/15.

[152] American Bar Association. Preparing for Family Mediation. Available at http://www.americanbar.org/content/dam/aba/images/dispute_resolution/Mediation_Guide_Family.pdf

BIOGRAPHICAL SKETCH

Desmond D. Flagg was born in Atlanta, Georgia on July 26, 1981to Charlene Flagg and James Banks. Desmond has a daughter named Emma and a son named Dasher.

Desmond earned a Bachelors Degree in Psychology from Columbia University, and a Masters Degree in Public Health from Hunter College—City University of New York (CUNY) prior to earning his PhD in Public Health Policy from The Johns Hopkins Bloomberg School of Public Health.

During his time at Johns Hopkins, Desmond served as a Teaching Assistant for a number of courses related to Public Health Policy. Desmond also served as a Research Assistant at the Johns Hopkins Center for a Livable Future. In addition, Desmond served as a Research Assistant for his Academic Advisor, Dr. Sara Bleich, on projects related to sugar-sweetened beverage consumption among inner city youth in East Baltimore. Lastly, Desmond earned a Certificate in Health Care Disparities, under the tutelage of Dr. Thomas LaVeist.

Desmond is a co-author on an American Journal of Public Health publication, titled Reduction in Purchases of Sugar-Sweetened Beverages Among Low-Income Black Adolescents After Exposure to Caloric Information (2011).